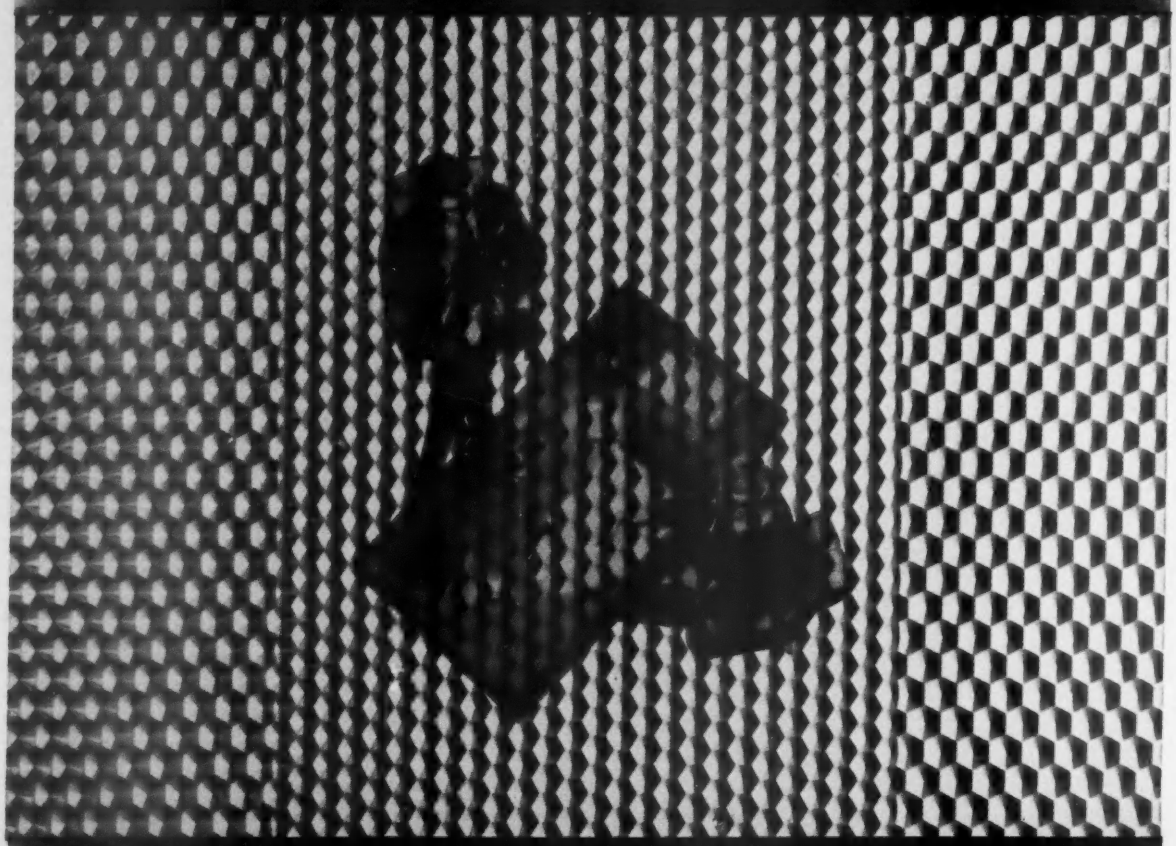
Don't just say cables – say AEI

IF FLUORESCENT TUBES COULD ONLY SEE . . .



they might find themselves peering down through this while their progeny, the little lumens, become white with heat. For confinement to precise lines of conduct is enough to make any lumen glow.
Holophane, through their scientific systems of prismatic control, bring to fluorescent lighting a unique approach where brightness is controlled and high utilization of light sources is achieved. Light is where you want it—on the working plane—and not in the eyes. Write for latest Holophane lighting catalogues, without obligation.

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Durium Drills give sensational cutting performances in brick, tile, cement, slate etc. They are silent in operation and have quite exceptional long-service capacity for withstanding the abrasive action of masonry that so quickly ruins ordinary drills. Patented rapid-helix flute forces out spoil and prevents clogging. Refuse substitutes—*only a genuine Rawlplug Durium gives such life and service.* First resharpening FREE!

For use in Wheelbrace or slow speed electric drill.

17 sizes 5/32″ to 1″ cutting diameter and **11** *long series* ¼″ to 1″ cutting diameter for up to 16″ drilling length.

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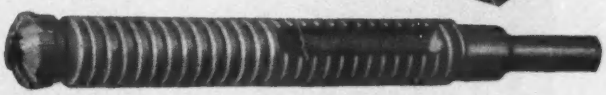
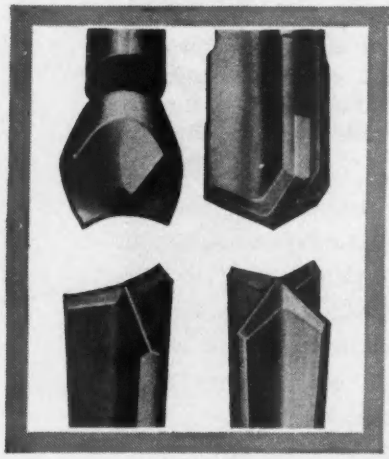
9 sizes from ⅛″ to ½″ cutting diameter.



RAWLCRETE CONCRETE DRILLS

Designed for hole boring in concrete, hard brickwork and tiles with portable rotary action tools. Four to six cutting edges (depending on size)—if one should be damaged the remainder will go on cutting. Spoil automatically cleared away through cored shank and ejected via the slot. By adding extension rods to the Extension Type Rawlcrete Drill, any depth hole can be drilled. **26** sizes ¼″ up to 2″ cutting diameter.

Percussion Tools



DURIUM TIPPED HAMMER DRILLS For percussion drilling in hard materials such as Granite, Blue Bricks, Concrete etc., Durium Hammer Drills have a very much longer life than ordinary percussion drills. Can be used in most electric, and some types of pneumatic hammers. **13** sizes from 7/16″ nominal drill diameter to 1¾″.

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VIBRATORY TOOLS THE SPECIALLY DESIGNED Vibroto Drills put up spectacular performances in the drilling of concrete and other hard materials. They are manufactured specially for use in the **Rawlplug Vibroto Drilling Machine**—a high-efficiency power tool which allows for a rotary and two vibratory actions (Light Rapid and Heavy Slow). **10** sizes 5/32″ up to 23/32″ cutting diameter.

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for illustrated literature describing fully these and other Rawlplug high performance drills and power tools.

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B702
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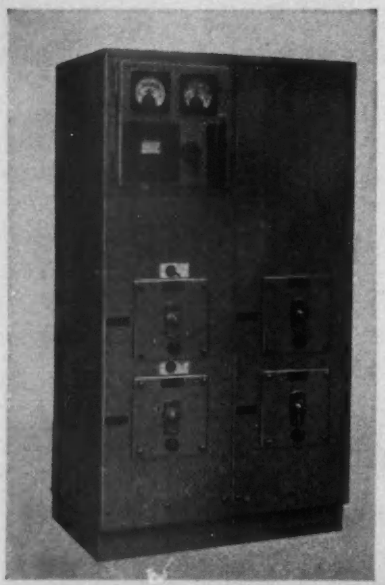
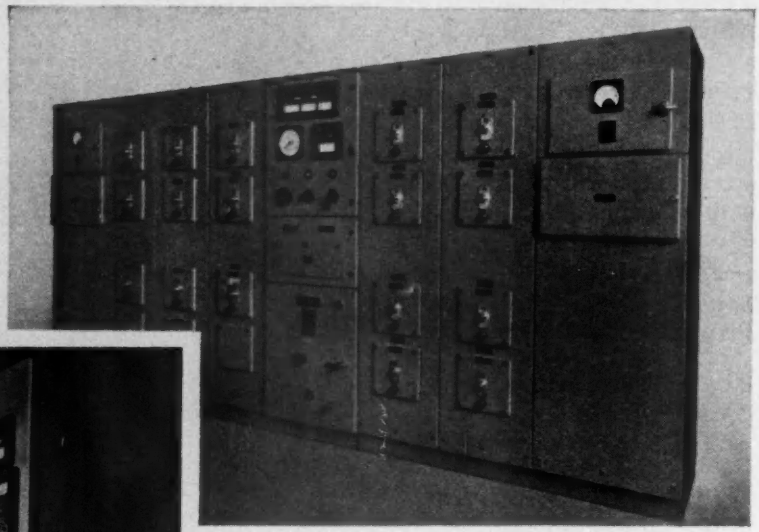
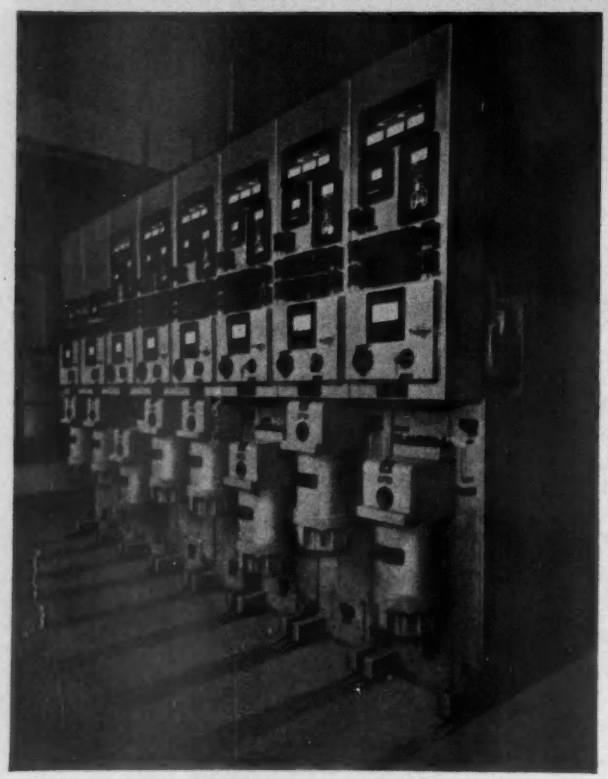
South Wales Switchgear in the picture

at the new B.B.C. T.V. centre







Top Left and Above. 2 fuse-switchboards controlling medium voltage supplies.
Bottom Left. One of the five 11kV 250MVA switchboards.

Switchgear plays a vital role in Television presentation. S.W.S. switchgear ensures the safe and dependable supply of electrical power to this important phase of human activity.

5 Switchboards comprising 30 panels of 11,000 volts 250MVA switch units and 3-panel ring main unit, together with 10 fuse-switchboards comprising 94 circuits, distribute a high voltage and medium voltage supplies at the new T.V. centre of the British Broadcasting Corporation.

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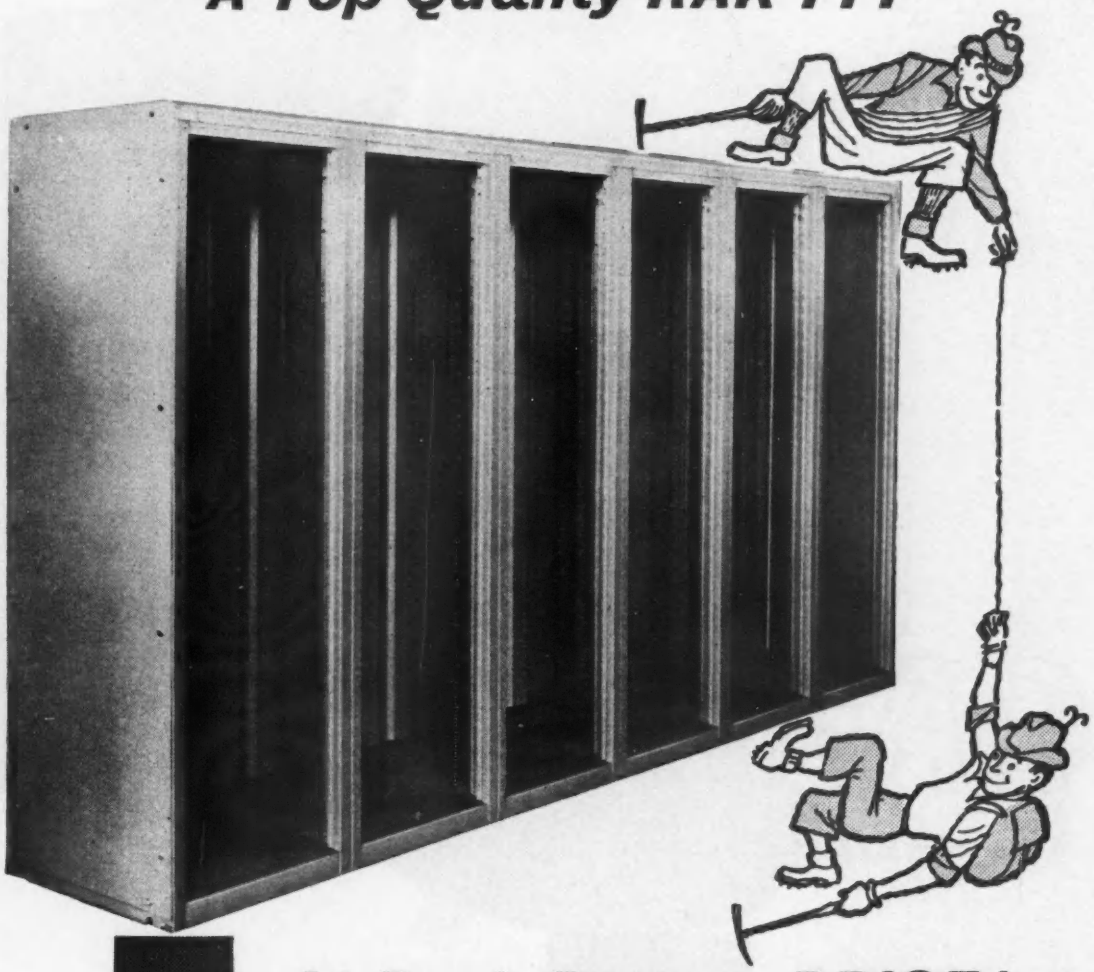

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6 feet Multi-Bay IMRAK at £27.1.8 per bay. *And* there is a Quantity Discount reduction to £25.9.2 each by the 100.

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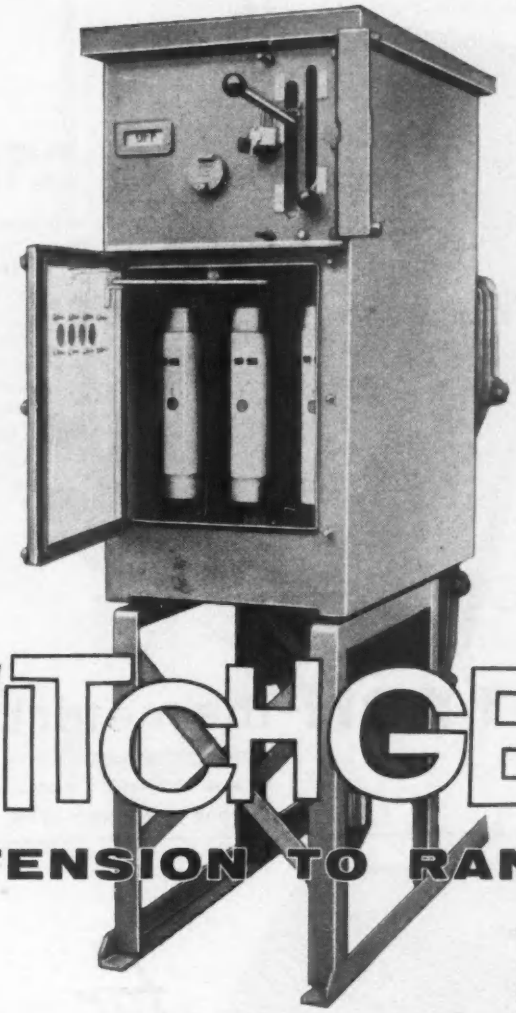

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EXTENSION TO RANGE

Brush type HF 11 High-Voltage Switch-Fuse Units for indoor or outdoor service are an economical method of controlling and protecting power transformers. Extensive technical development of powder-filled fuse-links for use in the air-insulated fuse chamber of Brush units has resulted in the availability of much higher current rating fuse-links enabling these switch-fuse units to be used for the control of 1500 kVA 11 kV transformers.

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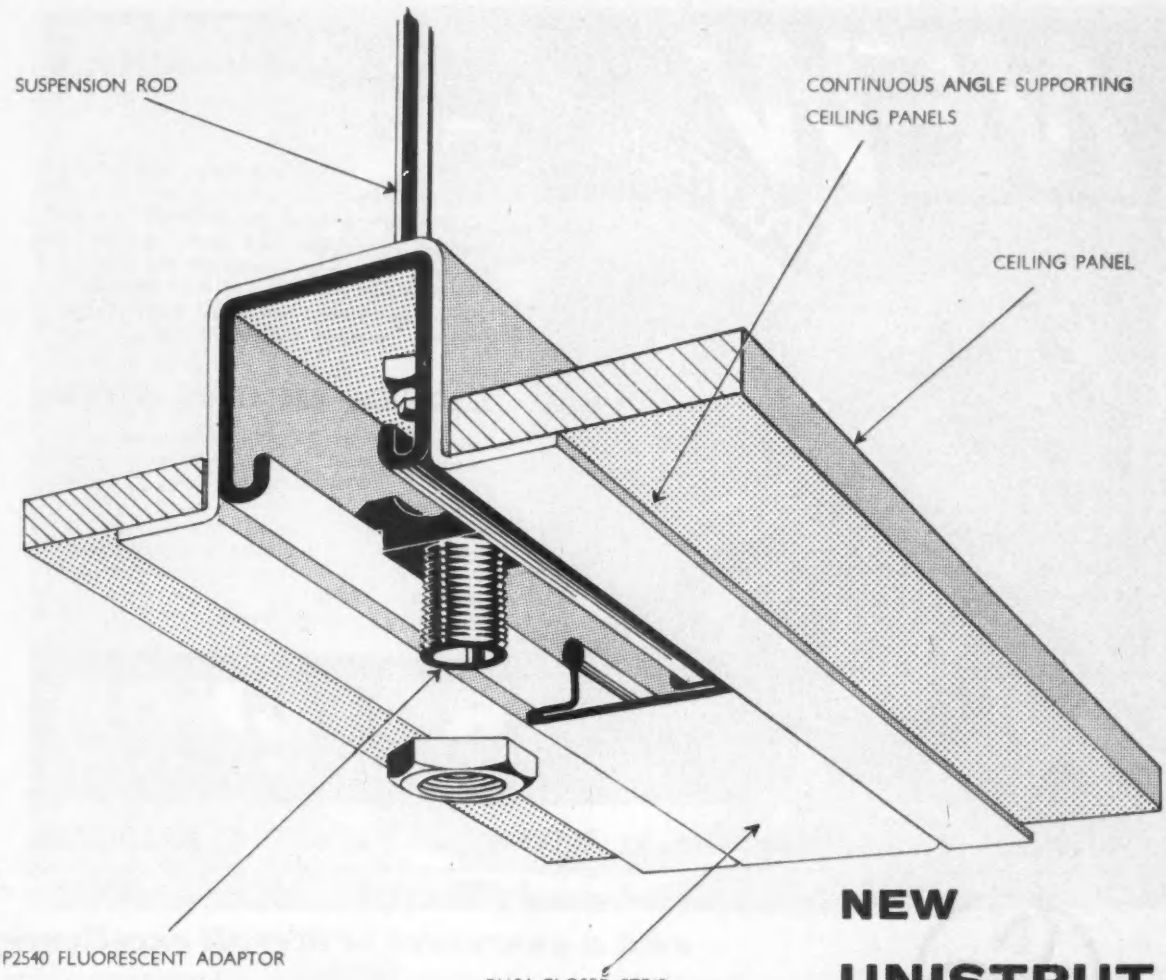

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SUPPORTS CEILING AND FLUORESCENT LIGHTING!

A new method of supporting fluorescent lighting trunking and false ceilings is provided by the new Unistrut ceiling trunking.

The new Unistrut 'top hat' section is simply placed over the top of the required length of basic Unistrut channel, and holes for suspension rods, etc., are drilled through both channels. The continuous angle of the new section permits ceiling panels to be closely fitted to either side of the channel which is itself left open until wiring installation is completed. Closure is made by means of standard Unistrut closer strip—wiring for fluorescent units being led down through standard adaptors. The resultant flush effect is both practical and neat.

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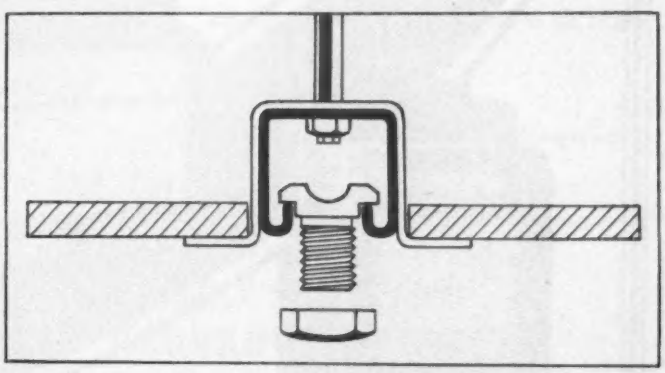

For details of this new section, or information about the Unistrut System and its many applications, write to:

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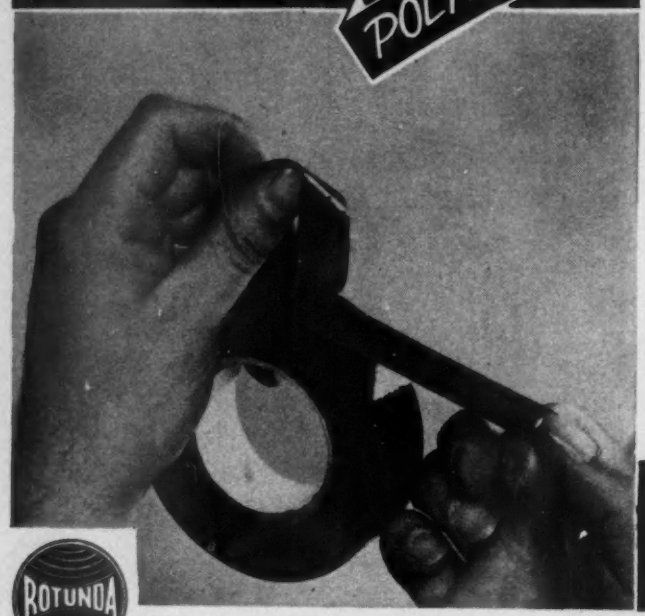
INTERLEAVED WITH THIN BLACK PLASTIC FILM



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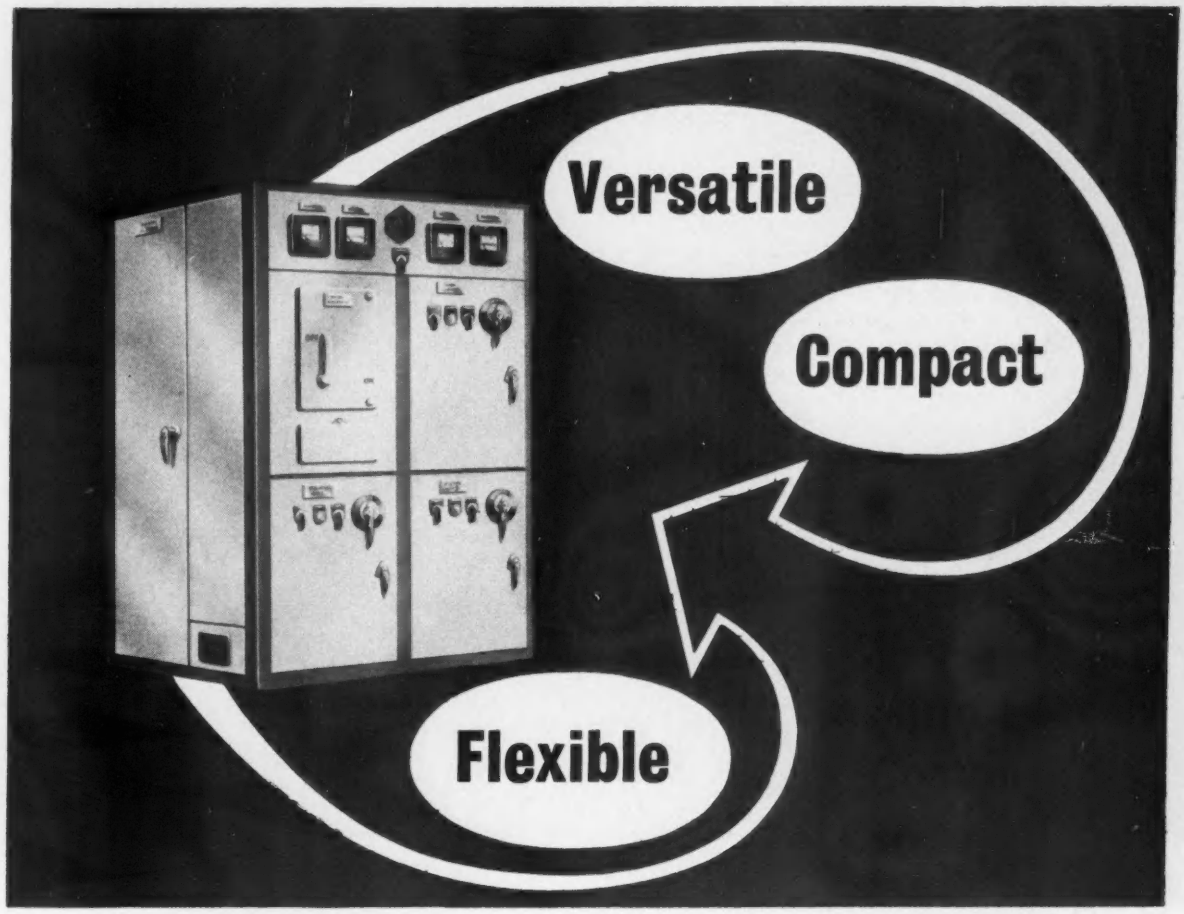

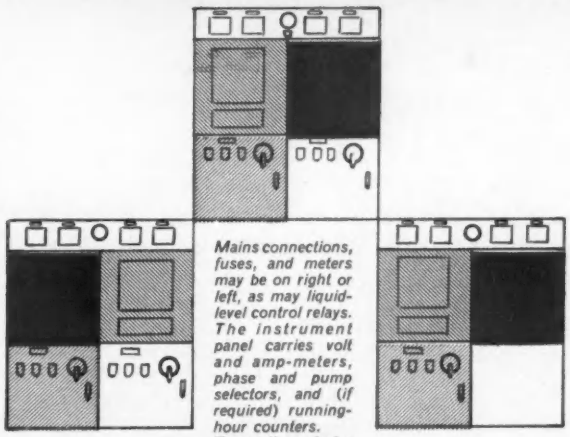

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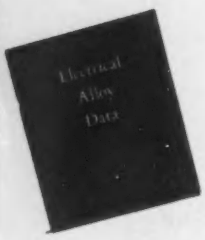

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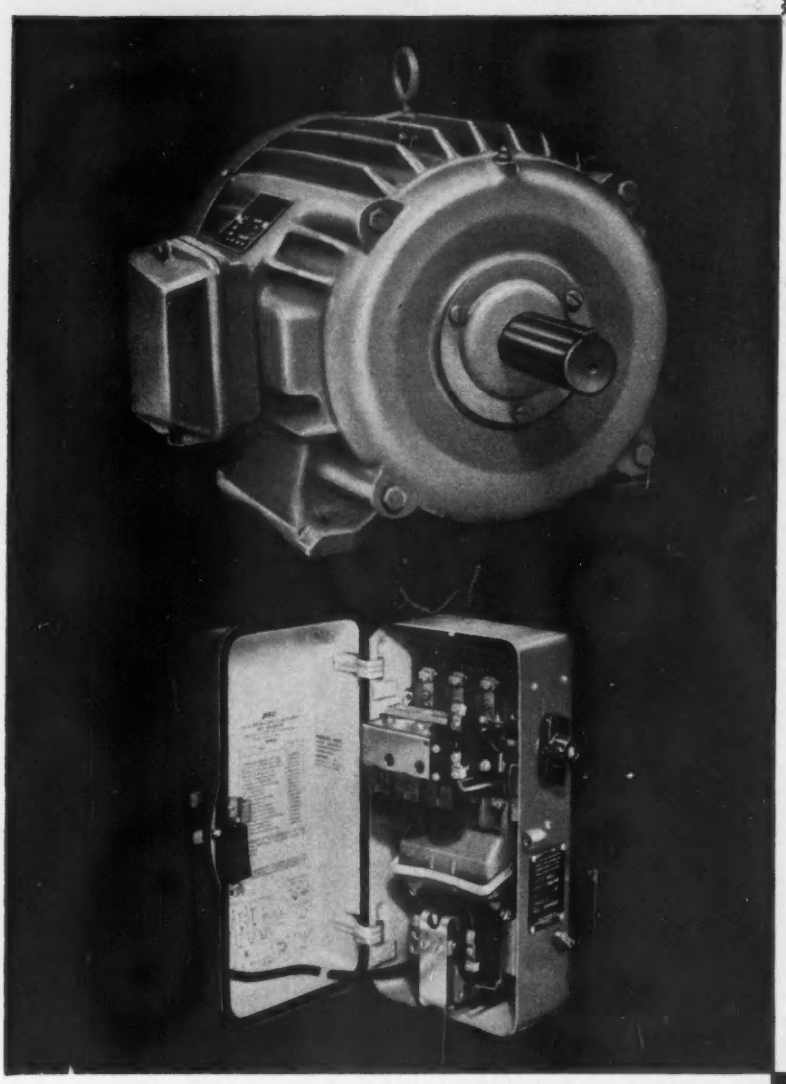

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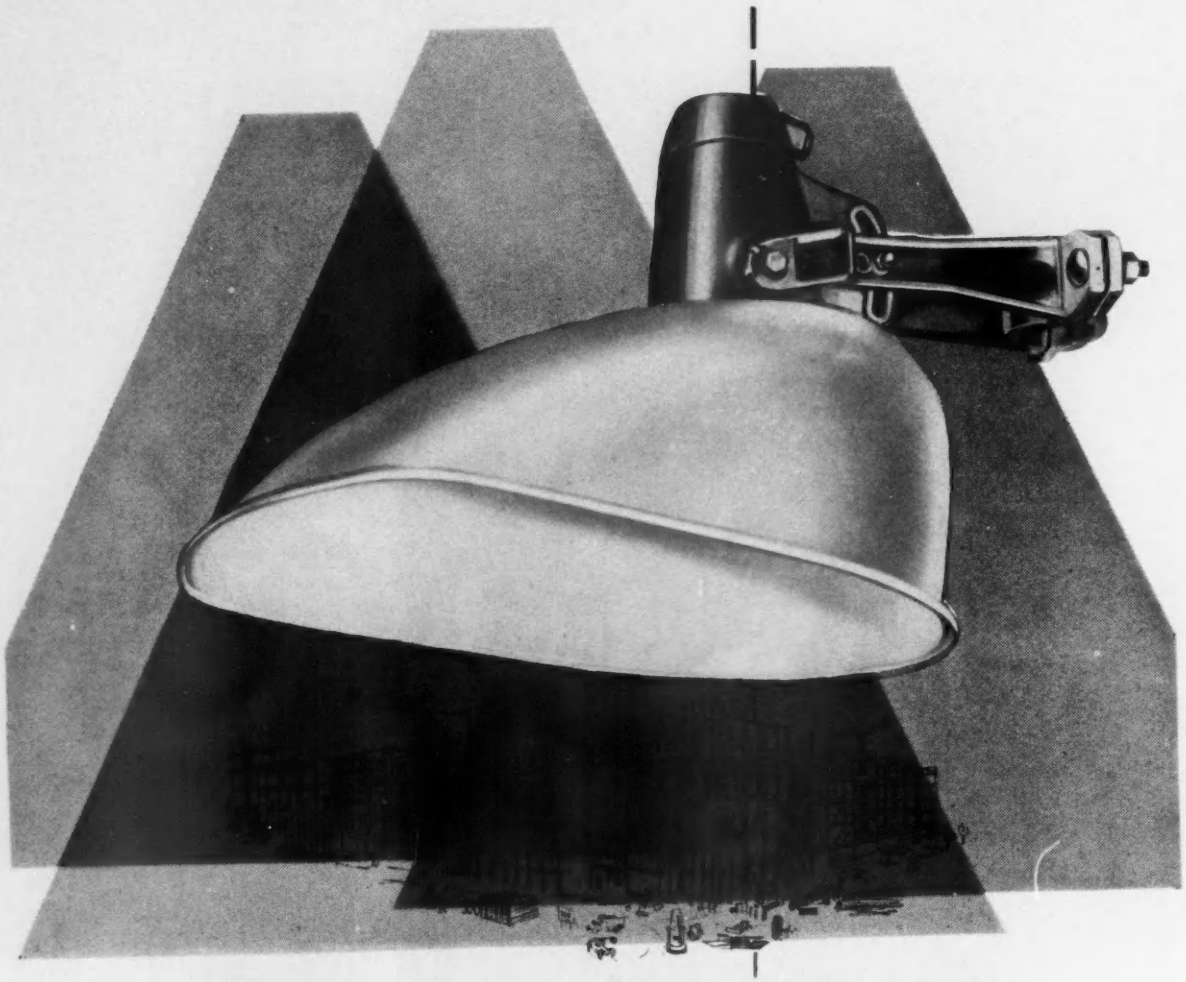

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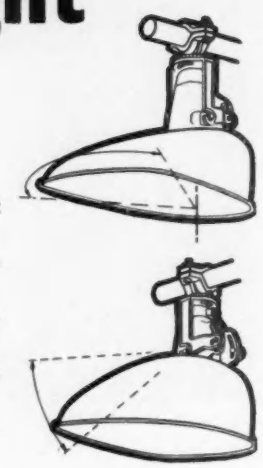

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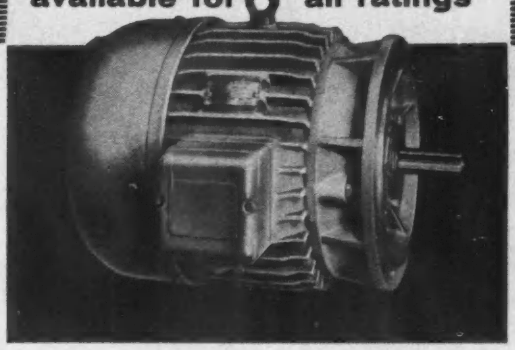

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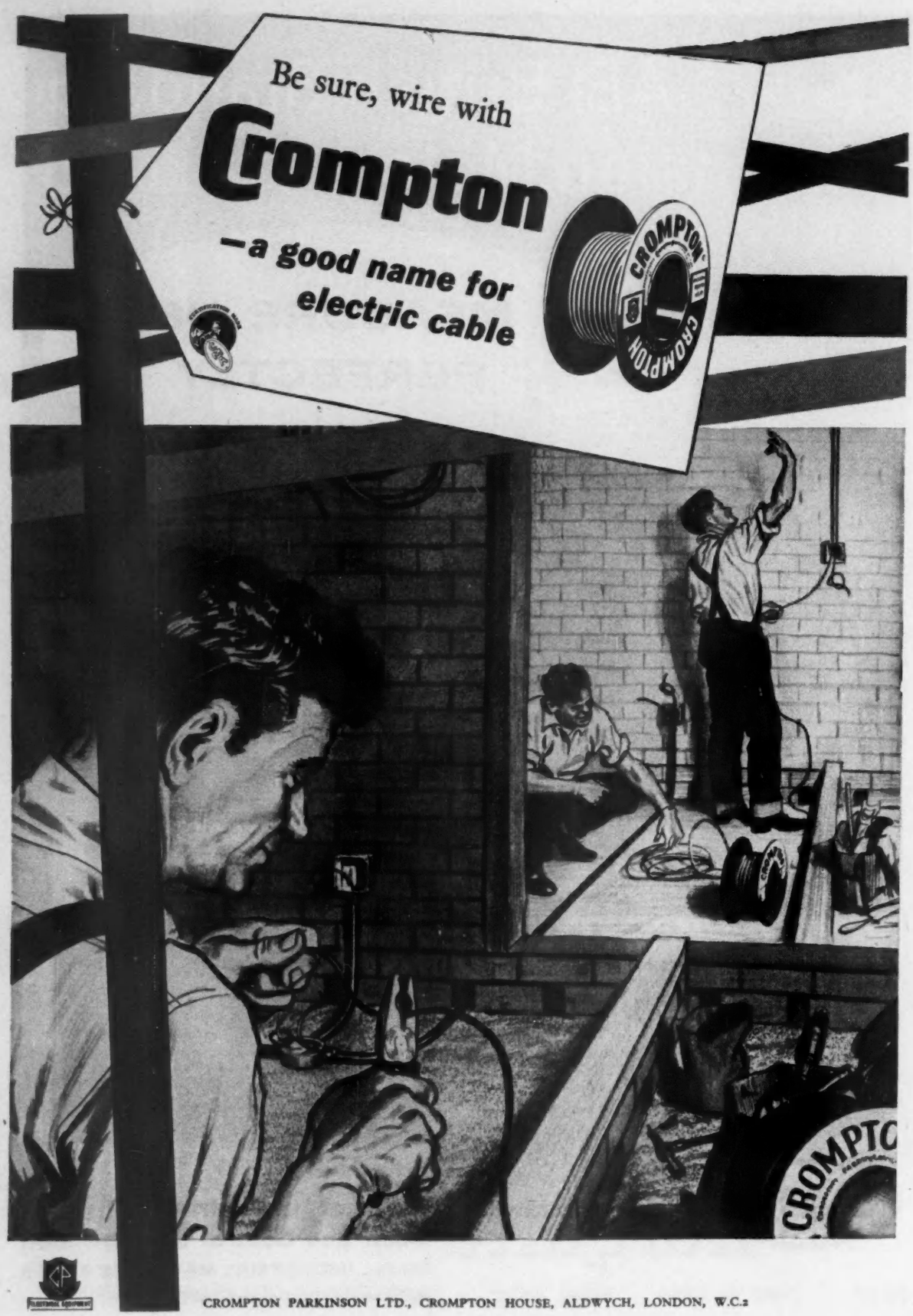

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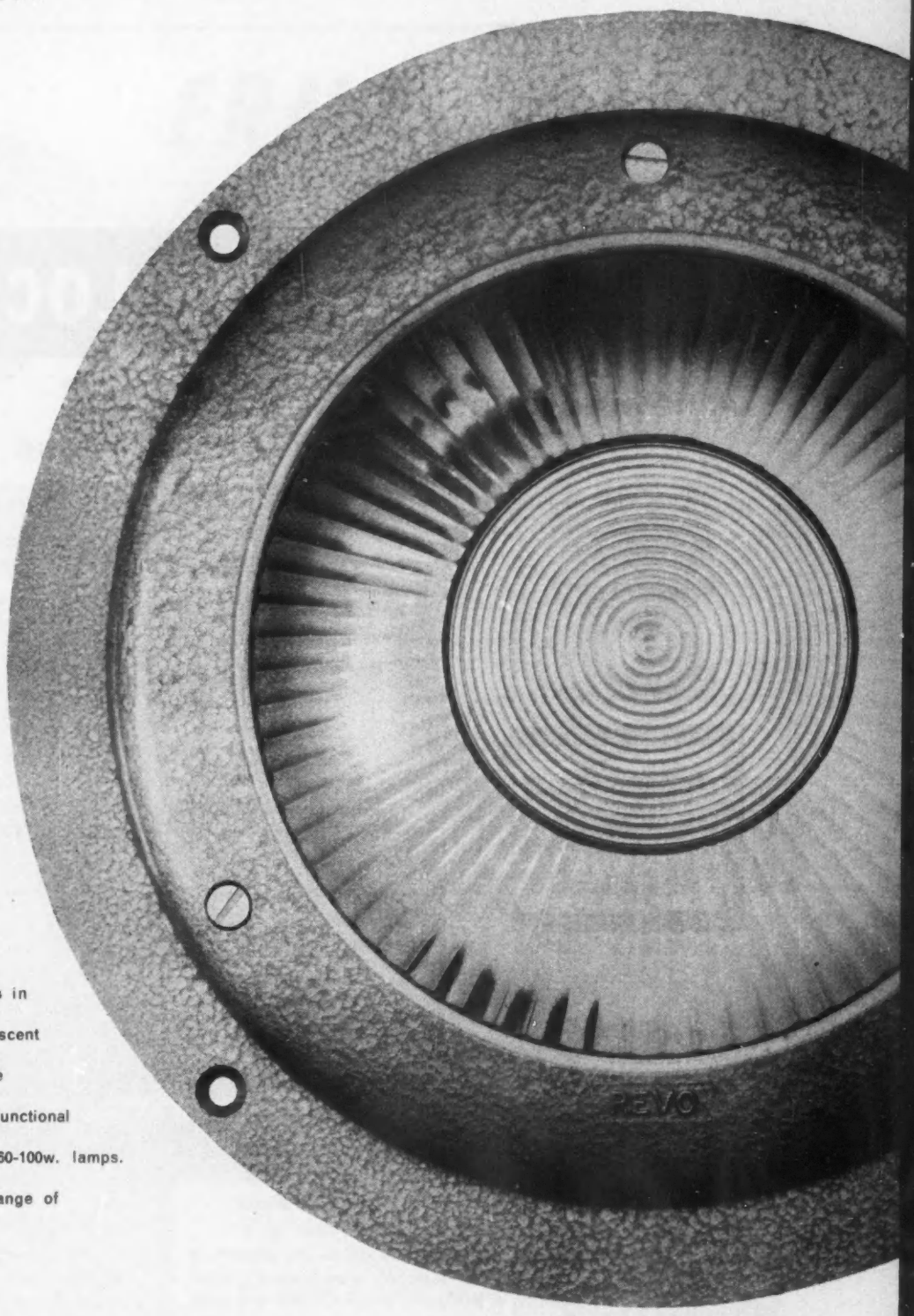

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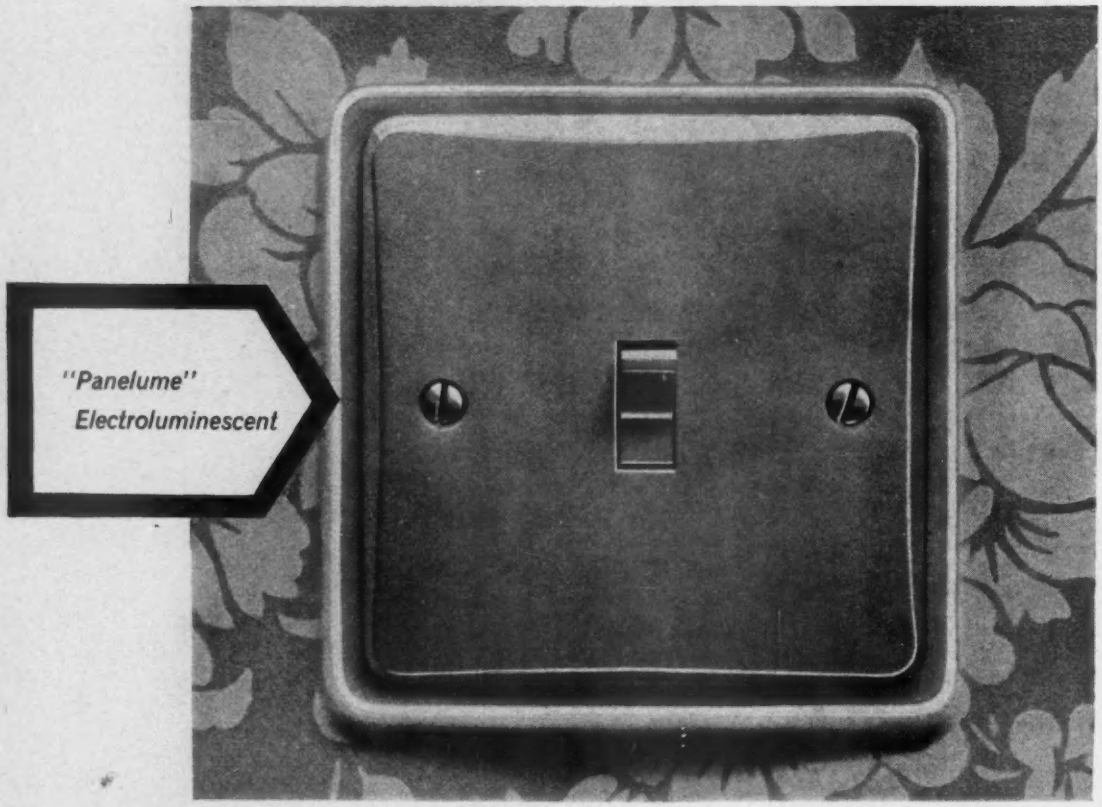
LUMINOUS LOCATOR

A new approach to Switch and Socket finding — in darkness



Ask for Leaflet No. 256

The M.K. Luminous Locator is the solution to the problem of detecting in darkness the exact location of Switches, Socket-Outlets and other accessories.

The Locator is placed between the wall and the plate of any flush accessory (accommodated in a flush box to BS 1299/1363 and having 2¾" fixing centres).

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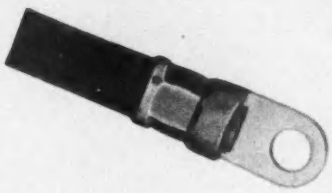
M.K. ELECTRIC LIMITED, SHRUBBERY ROAD, LONDON, N.9. EDMonton 5151



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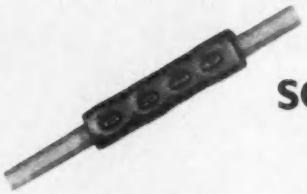

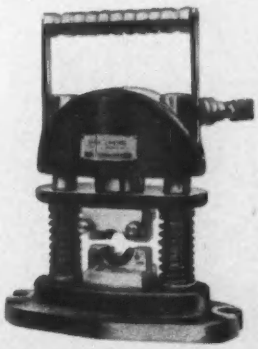

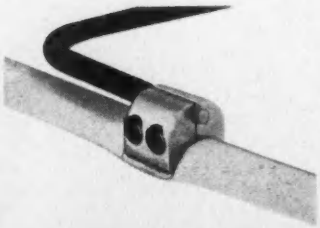

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FIRST with an inhibited water coolant that will not attack non-ferrous metals—HOUGHTOGRIND 45—the success of the 1960 Machine Tool Exhibition.

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Works and depots at: Birmingham, London (Southall), Manchester, Liverpool, Bristol, Glasgow.

In association with the Houghton group of companies all over the world.

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CERAMIC EMBEDDED RESISTORS

TYPE APPROVED—CLASS H.1

Values up to 200 k.ohms: ratings 5—200 watts.

New catalogue TG. Issue 4 available on request.

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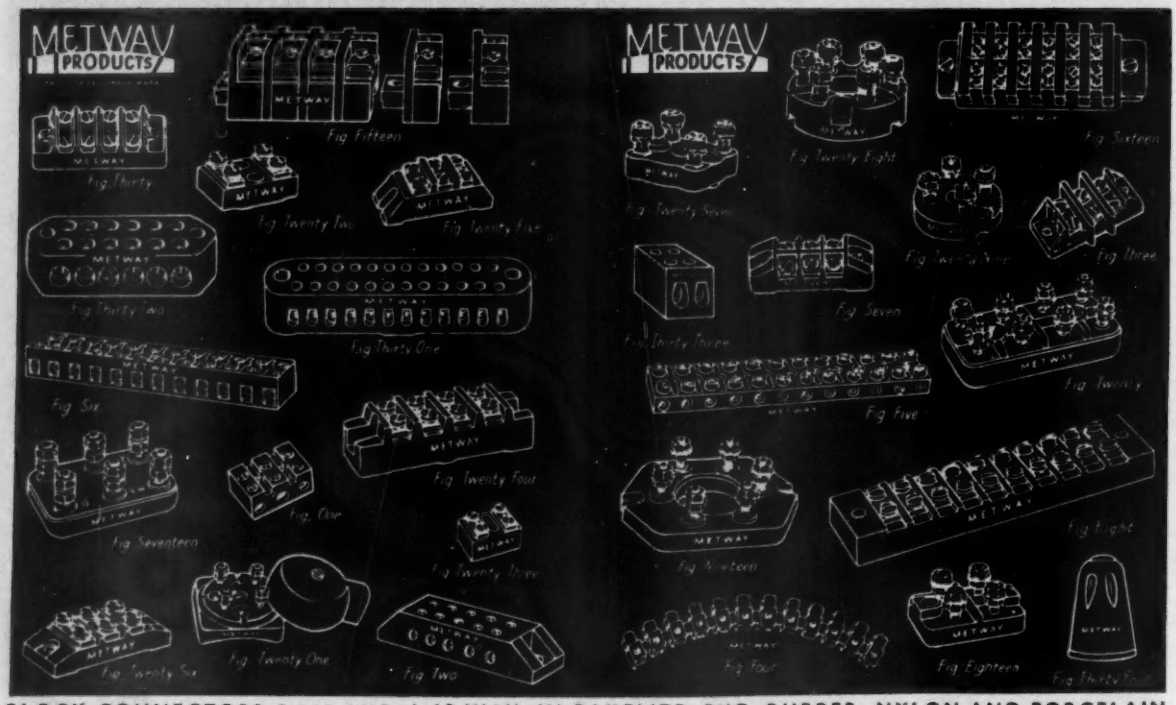

BLOCK CONNECTORS. 5-100 AMP. 1-12 WAY, IN BAKELITE, PVC, RUBBER, NYLON AND PORCELAIN

★FOR FULL DETAILS WRITE FOR CAT. No. NBQ/12ET. **METWAY • KEMP TOWN • BRIGHTON**

'HARCO'

PERFORATED MILD STEEL

CABLE TRAYS

provide a continuous chassis for the efficient attachment of cables and wires. With the Cable Trays once in position, subsequent alterations and additions to the wiring can be speedily effected at minimum cost, without drilling or plugging.

Trays and bends are available from 2 in. to 36 in. wide; the standard length of trays is 8 ft.

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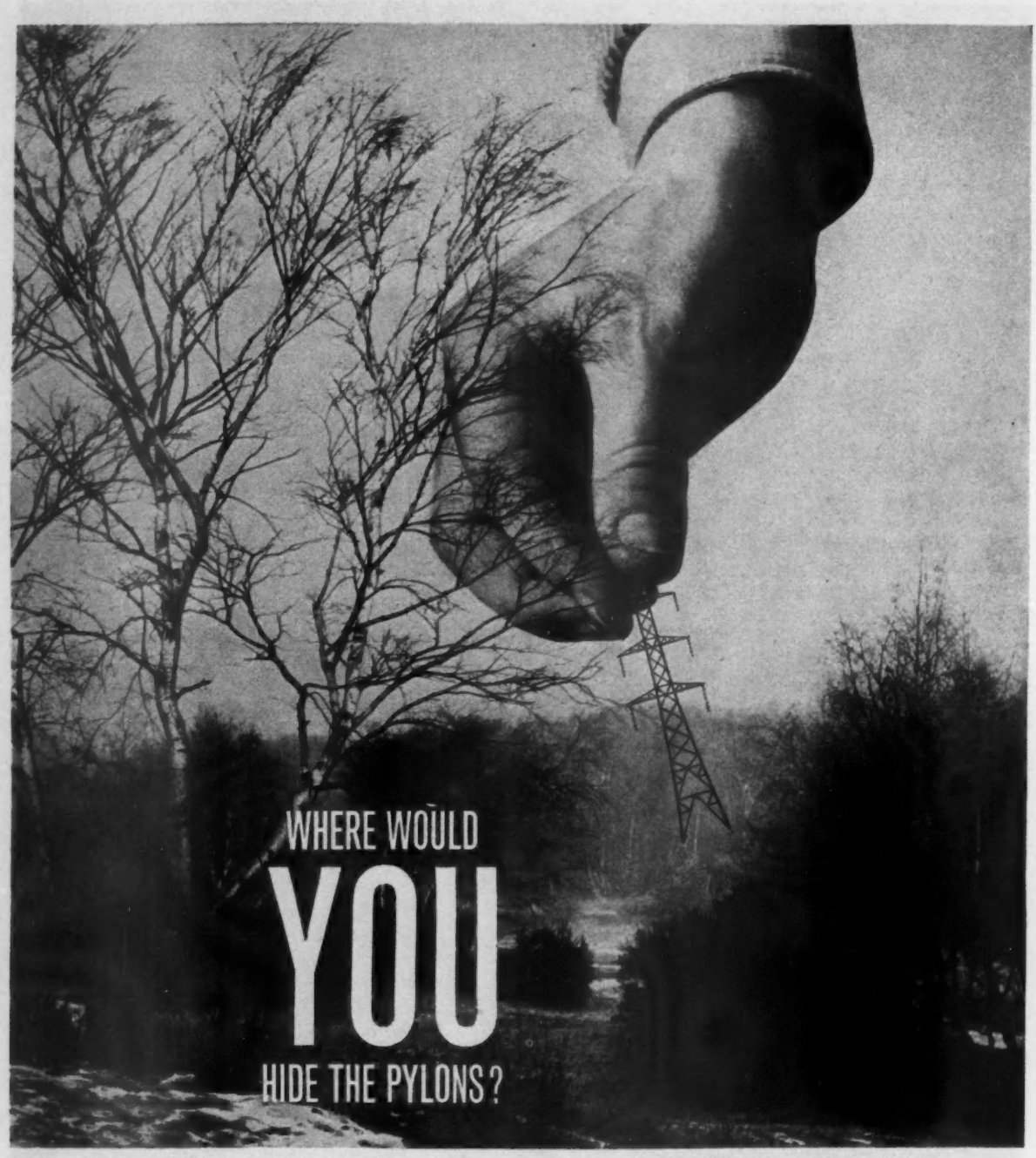

Not even trees can hide the pylons completely . . . but pylons there must be if people want the amenities that depend on electrical power. Over the next ten years Britain's power demands will double—and that means more overhead lines.

But although pylons can't be made invisible, power lines can be planned to follow the least conspicuous route, to take advantage of natural screens such as woods and hills, and only break cover when unavoidable. This kind of careful planning, which is going on all over the country today, is in the hands of the Central Electricity Generating Board, which is charged by Act of Parliament to provide an efficient and economical power supply to the nation, while doing everything possible to preserve the natural beauties of the countryside.

■ These advertisements are appearing in the farming and country magazines. The Central Electricity Generating Board thank electrical contractors for their co-operation in the past, and know that they will do all they can to preserve the amenities of the countryside.

THE CENTRAL ELECTRICITY GENERATING BOARD CEGB

NEWS SHEET

Government extend H.P. repayment period to three years; only minor sales improvement expected with electrical appliances. New regulations also prevent rental schemes which infringe spirit of restrictions. Finance houses limit three-year repayment to appliances over £30. (123, 149)

Manweb announce higher tariffs, first Board to act since increase in bulk tariff. Domestic primary rate up ¼d, secondary, 0·01d, but final unchanged. Off-peak tariffs also unaltered. (148)

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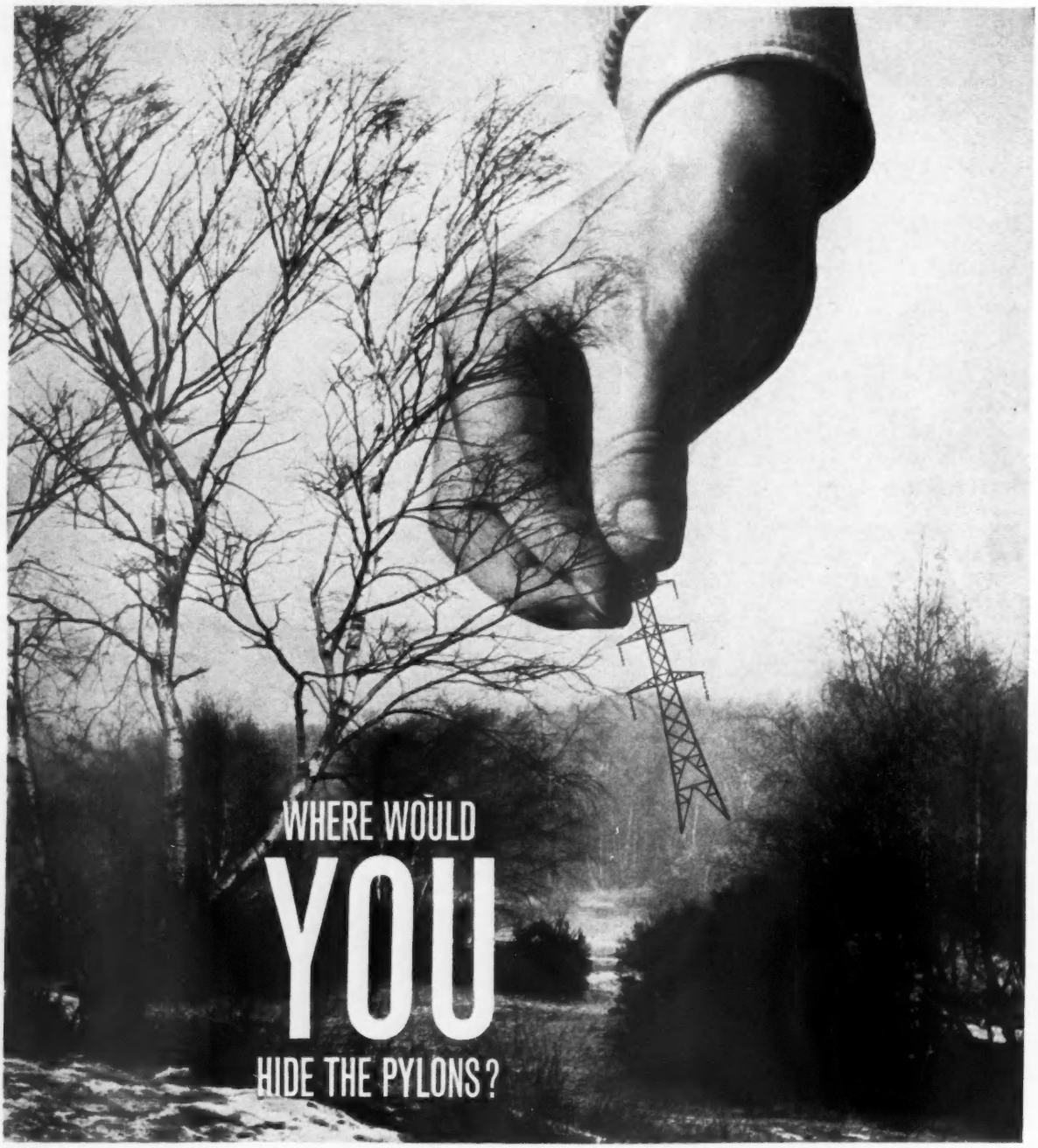
PEOPLE—Ex-NCB chairman, Sir Joseph Latham, joins AEI board . . . R. J. F. Howard becomes director of marketing, Metal Industries group . . . M. A. Griffith-Jones appointed general sales manager, Chloride Batteries . . . I. R. Lamb promoted to purchasing and stores controller, S. Wales EB, succeeding W. Hyland who becomes deputy manager, Cardiff and E. Central area . . . J. M. Stock re-designated chief engineer, Uganda EB, with L. Fergusson chief electrical engineer . . . R. G. Hooker leaving Brush to be deputy managing director, K. and L. Steelfounders Ltd. . . . E. W. Shepherd joins Beckman Instruments as sales manager . . . Lt-Col. G. S. Marston, former LDC chairman has died. (136, 138)



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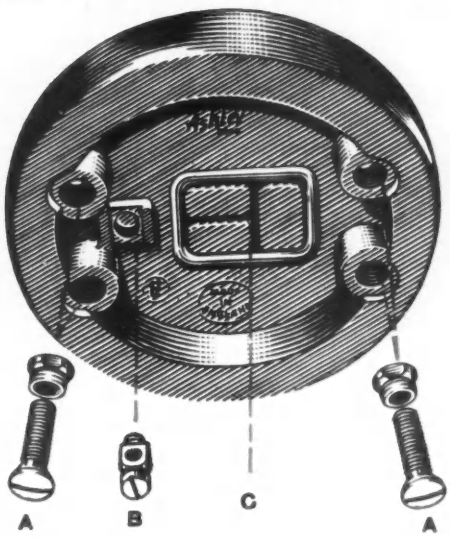

INTRODUCING THE Ashley 'POLYBLOK' (PATENT PENDING) a new and improved mounting block

Designed on completely new principles allowing easy location on ceilings, walls, independent of and before the accessory or light fitting is surmounted.

SPECIAL FEATURES

A. 2 B.A. x ¼" Plated fixing screws and tapped inserts—supplied loose.
B. Optional large capacity earth terminal for loop-in wiring.
C. Composite 3 way base Knockout—each section will take 3/.029 three core T.R.S., L.A.S., or P.V.C., cable.

Six Knockouts in sides for surface entry of 3/.029 cable. Either vertical or horizontal wiring entry for Ashley Batten Lampholder by selecting the appropriate 'Polyblok' fixing holes.

METHODS OF USE

1. Select fixing holes in 'Polyblok', present inserts to tapered recess and pull fully home by tightening 2 B.A. screw; remove screw and apply 'Polyblok' to working surface with wood screws in holes without inserts. The accessory can then be simply fitted by using 2 B.A. screws. The fitting or accessory can be removed and re-located, or taken down for inspection without risk of damage to plaster surfaces or losing screw grip.
2. Use two wood screws to fix 'Polyblok' in position, then after wiring ends are made off, use two further wood screws through the accessory and the unused pair of holes in the 'Polyblok'. This allows independent location of the accessory, using wood screws.
3. Use one pair of wood screws through both 'Polyblok' and accessory in the conventional manner.

Cat. No.	DIMENSIONS			KNOCKOUTS		For Access-ories of Dia.	Colour	Quan. per Carton	Per Dozen List
	Dia.	Pro-jection	Fixing Centres	Base	Sides				
MB 439	2½"	¼"	Two 2"	Com-posite	6	2½"	Brown	2 doz.	7/4
MB 440	"	"	"	3 way	"	"	Cream	"	8/-
With Earth Terminal									
MB 439 E	2½"	¼"	Two 2"	Com-posite	6	2½"	Brown	2 doz.	9/8
MB 440 E	"	"	"	3 way	"	"	Cream	"	10/4
MB FS1	2 BA x ¼" plated fixing screw and insert							2 doz. sets	2/- doz. sets

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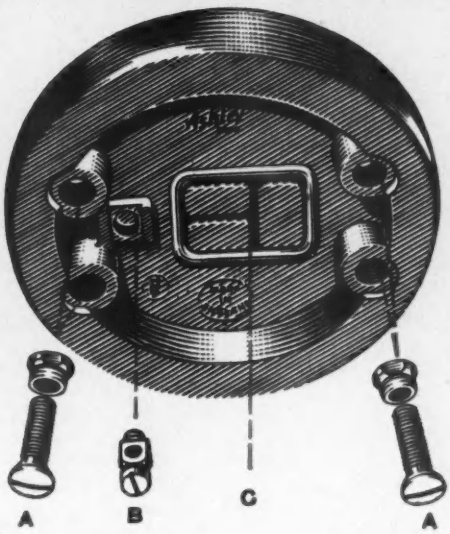

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Press a rubber cushion. It gives; adapts itself to take varying pressures. A Technical Service should do much the same thing. I.S.R., the makers of Intol SB Rubbers, realize that no two rubber users have precisely the same problem. They provide a service that's versatile. The kind of Technical Service that rubber users want.

I.S.R. supply the relevant facts, clearly assembled, accurately presented: and confidentially handled. Add to this the fact that when you buy INTOL SB Rubbers you know the price will remain stable, and you understand why people are saying "You know where you are with I.S.R."

INTOL SB Rubbers are now produced in a range of eight grades of solid rubber and four latices. Please write for details.

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stable price — consistent quality — assured delivery — technical service

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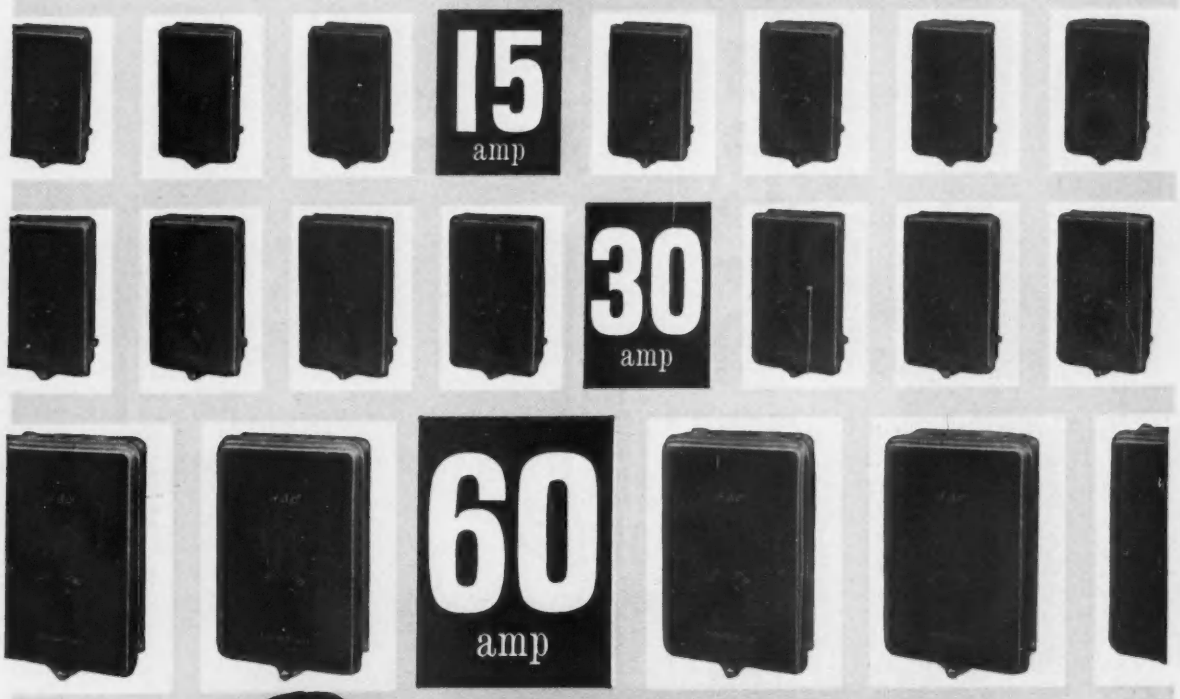
"HIDUTAC" switchfuses for



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15, 30 or 60 amp. 440 volt a.c. Single Pole and Neutral, Double Pole, Triple Pole, Triple Pole and Neutral Switchfuses with interchangeable H.R.C. or rewirable fuses.

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SWITCH AND FUSE GEAR • H.R.C. FUSES • OVERHEAD BUSBARS • RISING MAINS • CONDUIT • PIRELLI GENERAL CABLE • CABLE TRUNKING UNDER FLOOR CABLE DUCTS • ELECTRIC WIRING ACCESSORIES • BELLS

THE GENERAL ELECTRIC CO. LTD., KINGSWAY, LONDON, W.C.2

INSTALLATION EQUIPMENT GROUP HEADQUARTERS, FOUR ASHES, WOLVERHAMPTON

Simplex Star Switchgear

DISTRIBUTION FUSEBOARDS

Simplex Star "dead-front" Distribution Fuseboards are: low in price · easy to wire · completely safe because all live parts are shrouded, even with the fuses removed. There is provision for: circuit indentification on the fuse bank and neutral connections · surface or flush mountings, Ratings — 15, 30 or 60 amp, 500 volt A.C. or 250 volt D.C. Star Economy Distribution Fuseboards offer the same advantages as the Star Distribution Boards at the lowest possible price. More details of Simplex Star Distribution Fuseboards available on request.

SIMPLEX ELECTRIC COMPANY LTD.
CREDA WORKS, BLYTHE BRIDGE
STOKE-ON-TRENT, STAFFS
Branches throughout Britain and Agents throughout the World

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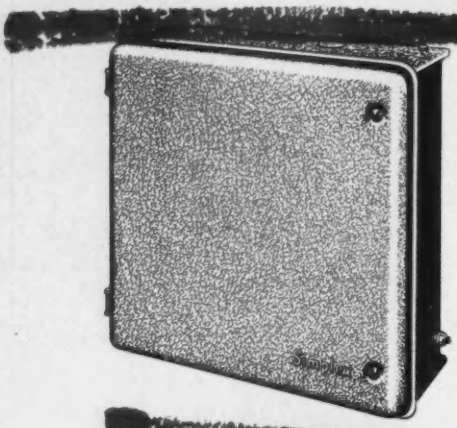
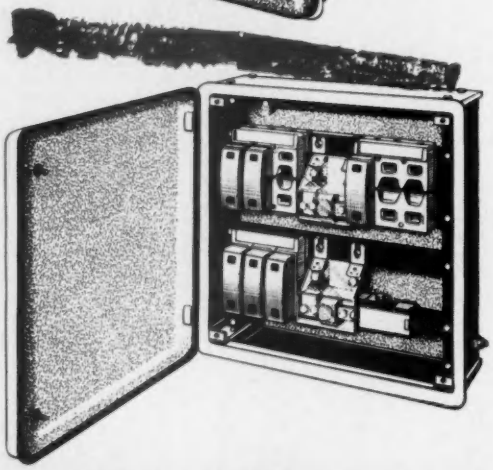
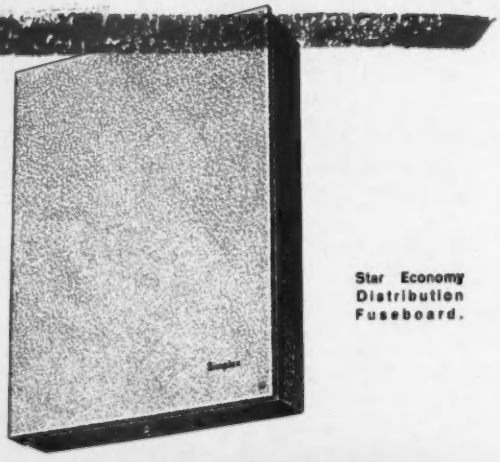


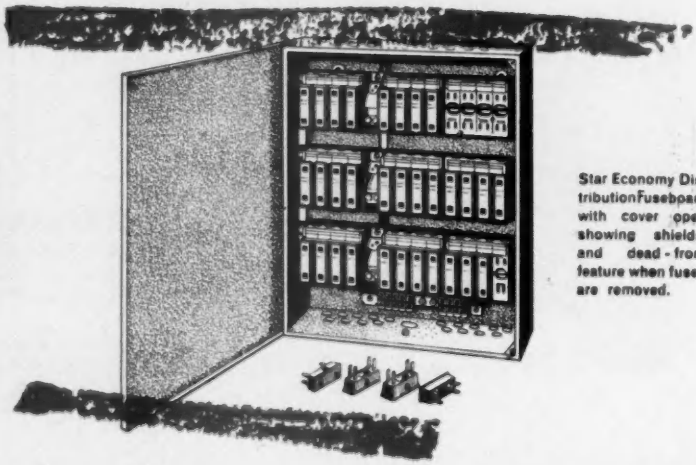
Star Distribution Fuseboard. Neat appearance. Strong All-Steel case.



Star Distribution Fuseboard with cover open; some fuses are removed to show dead-front feature.



Star Economy Distribution Fuseboard.



Star Economy Distribution Fusebpard with cover open showing shields, and dead-front feature when fuses are removed.

OVER 70,000,000 IN SERVICE

THE SAME STABLOK AS ORIGINATED BY FPE

THE FEDERAL PACIFIC ELECTRICAL COMPANY - NEWARK - U.S.A.

FROM 5 TO 60 AMPS

IMMEDIATE DELIVERY FROM STOCK

ARE INSTALLED IN
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BLOCKS OF FLATS
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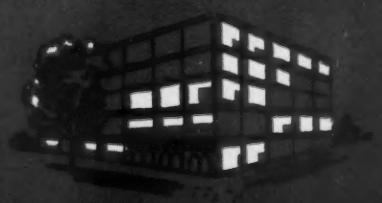

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MOST
PROVEN
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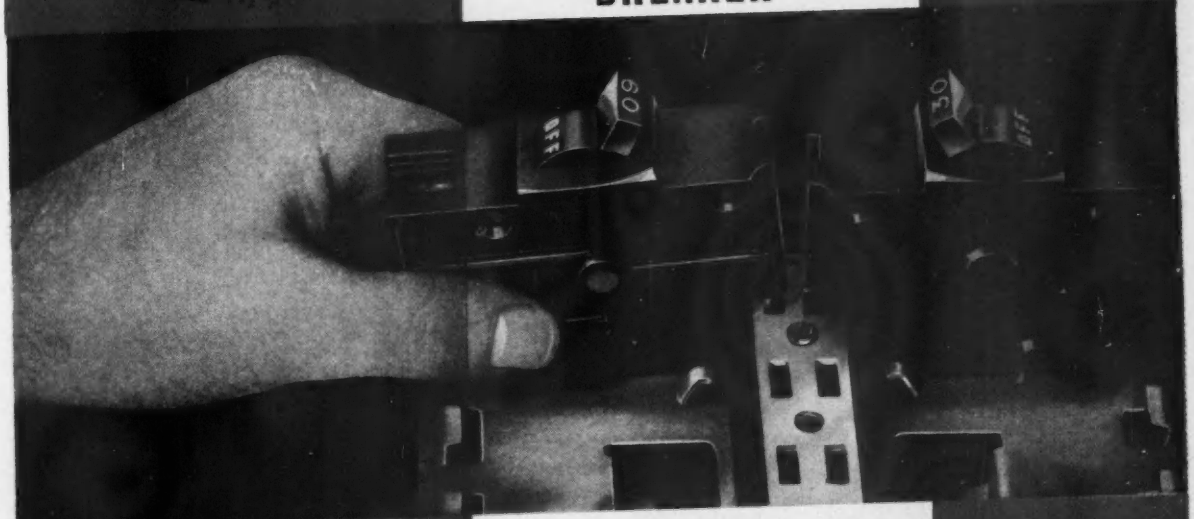

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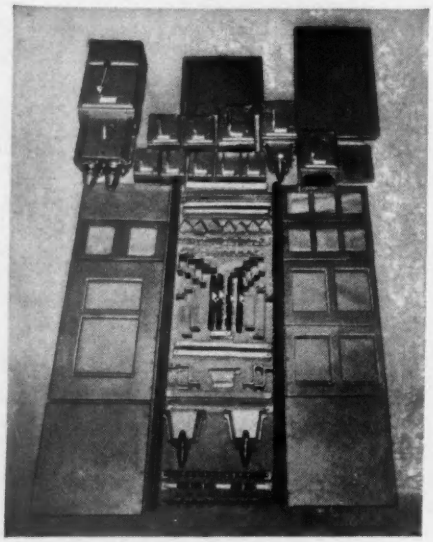
CUBICON
SWITCHBOARD
BUILT IN 24 HOURS
BY ONE MAN!



IN A SWITCHROOM
MEASURING ONLY
12ft x 6ft x 7ft 6ins HIGH

This 'CUBICON' cubicle switchboard was built and installed by the Midlands Electricity Board at Sebright School, Kidderminster.

In 12 hours, one man had erected the cubicle inside the switchroom. In 24 hours, including erection time, the cubicle was fully installed and interconnected.

The switchroom was, in fact, too small to allow the photograph of the board to be taken except through the open doorway. This board was built from sets of packaged 'CUBICON' components and 'TS' switches without any factory assistance or prompting, although this, of course, is readily available if required.

Photographs by courtesy of The Midlands Electricity Board and The Governors of Sebright's Endowed Schools, Wolverly, Worcs.

* ***LET CUBICON SOLVE YOUR CUBICLE SWITCHBOARD PROBLEMS*** ***Fill in the coupon below for full details.***

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GLASGOW 73 Robertson Street, Glasgow C.2. *Tel: CENtral 2479*

To DORMAN & SMITH LTD., Preston, Lancashire.

Please send me details of the Dorman 'CUBICON' system of Cubicle Switchboard Construction.

NAME .....
POSITION .....
FIRM .....
ADDRESS .....
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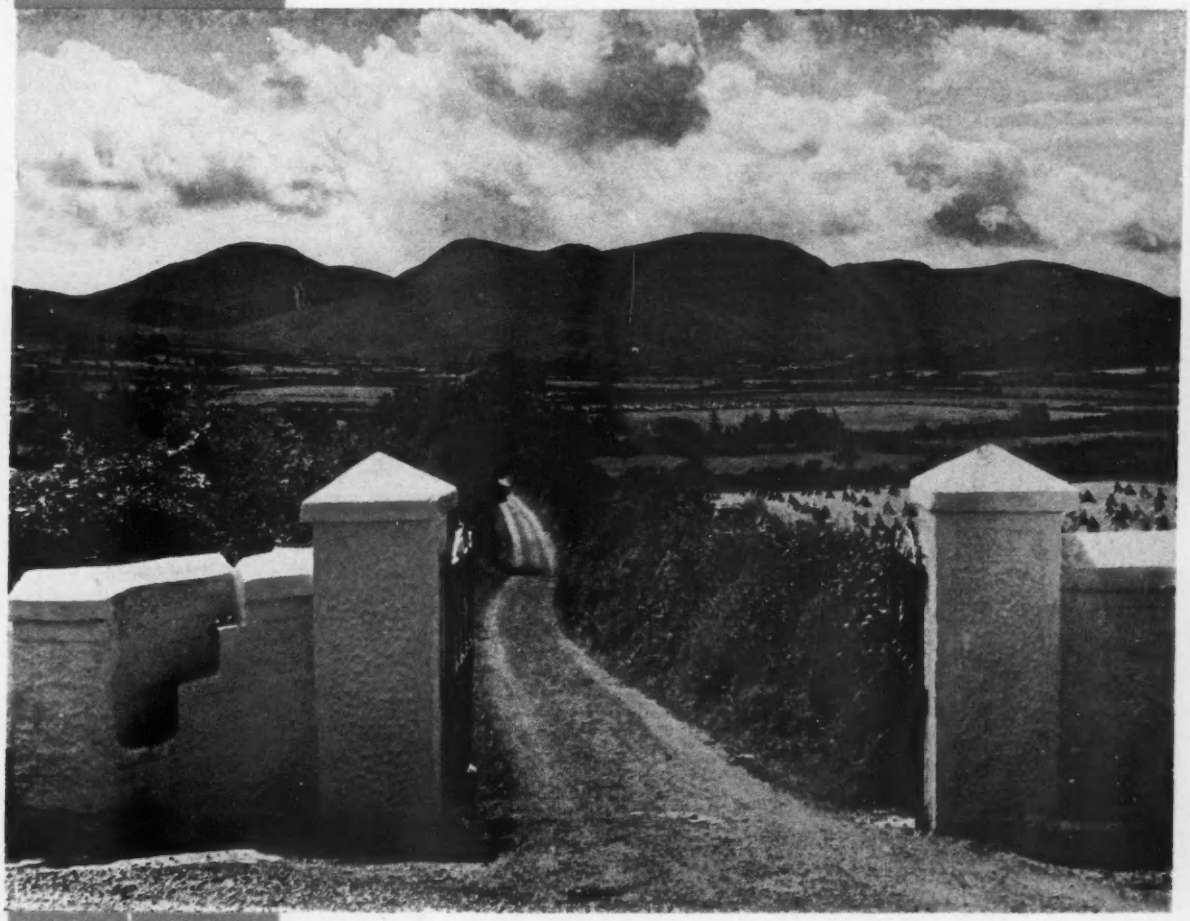
'Tis distance lends enchantment to the view,
And robes the mountain in its azure hue.

(Pleasures of Hope by Thomas Campbell)



By courtesy of Tourist Information Centre, Belfast

Irish cables are manufactured amidst scenery depicted above, showing the famous and beautiful Mourne Mountains.

IRISH CABLES will stand inspection right through to the very core, as a result of the high quality of materials used and constant vigilance and inspection throughout manufacture

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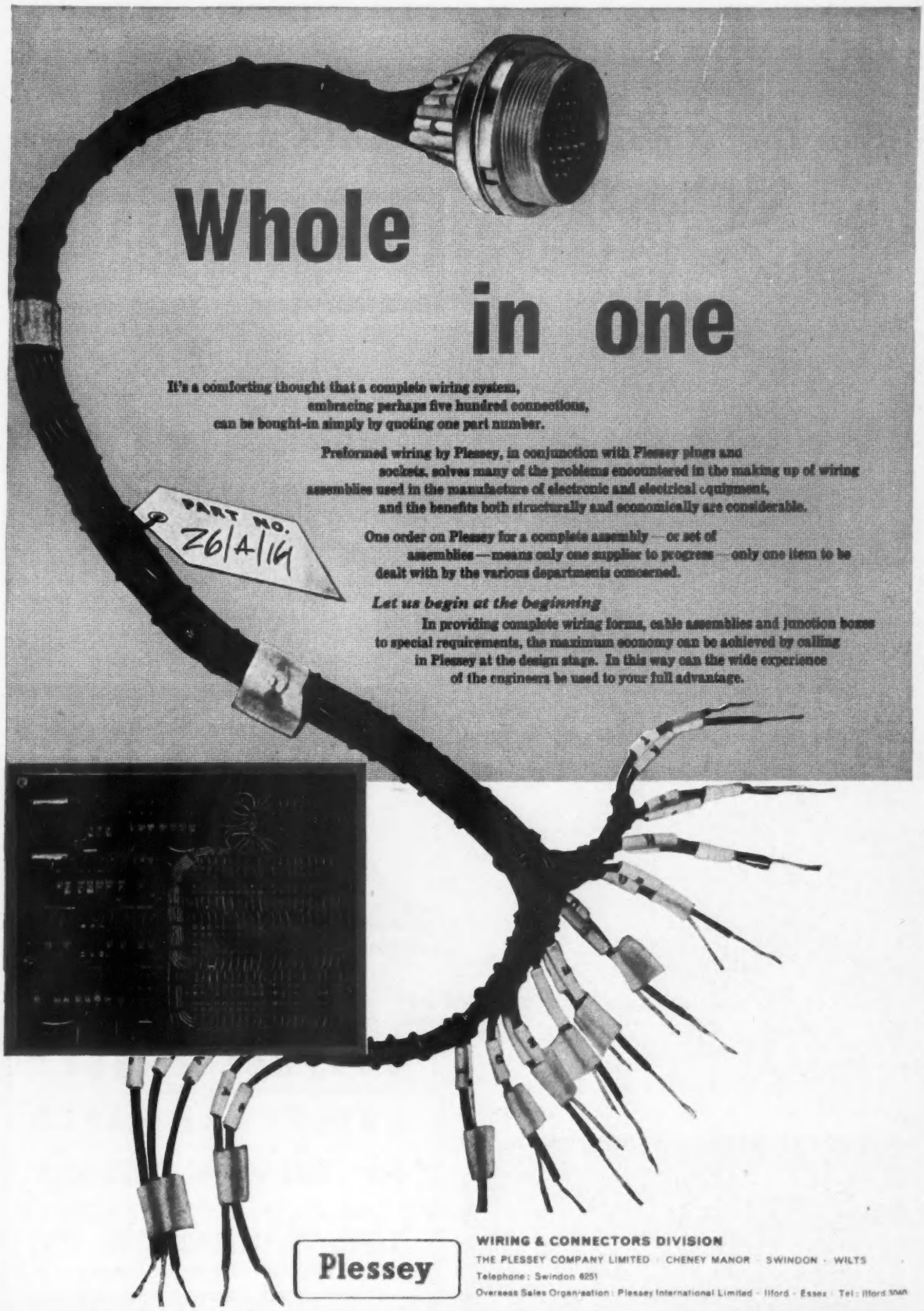

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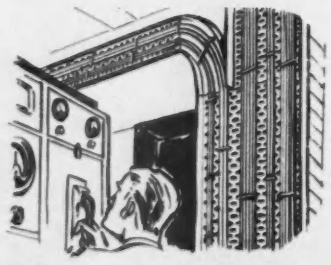

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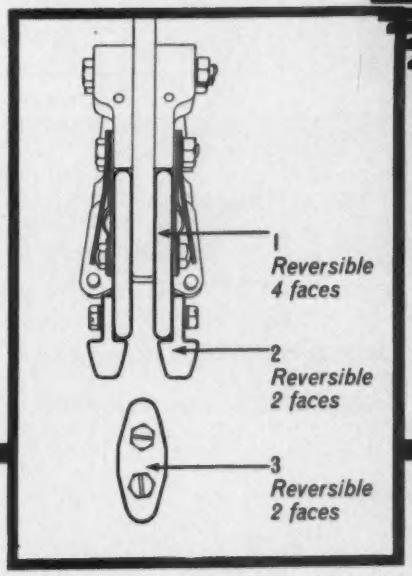

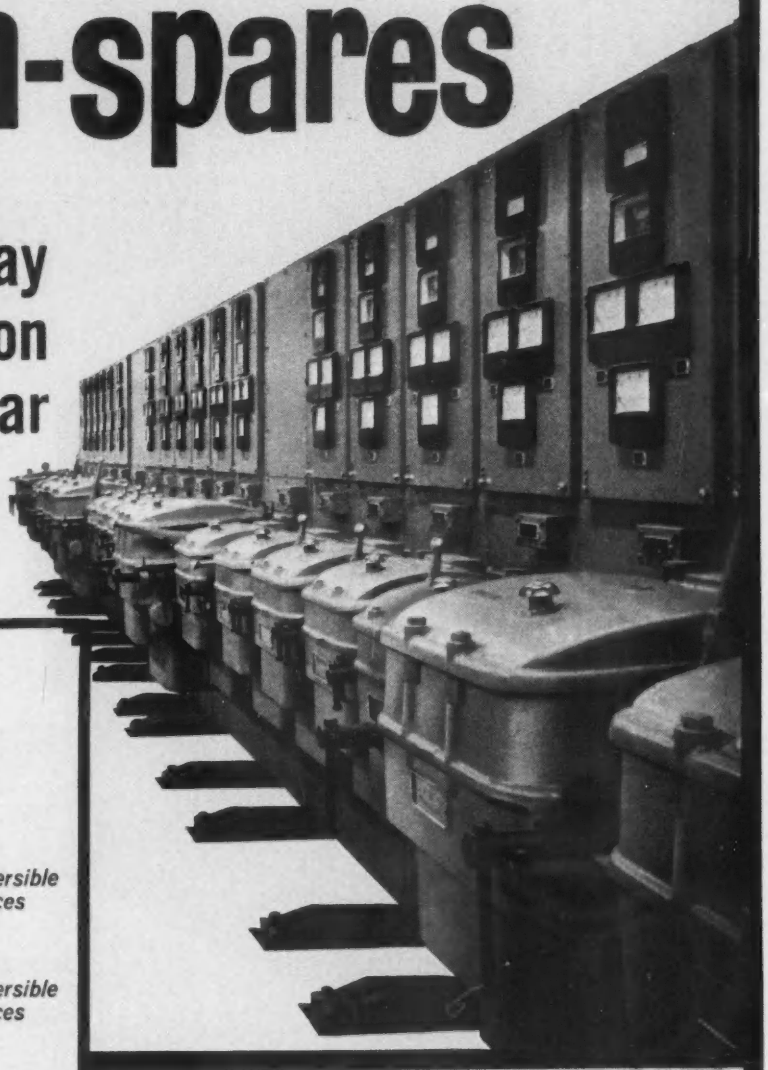

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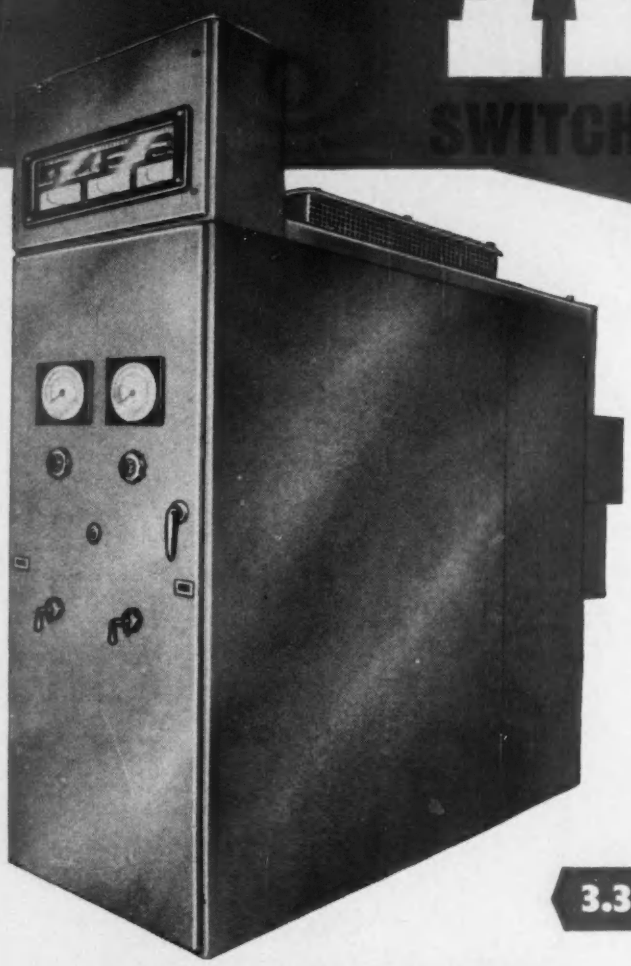

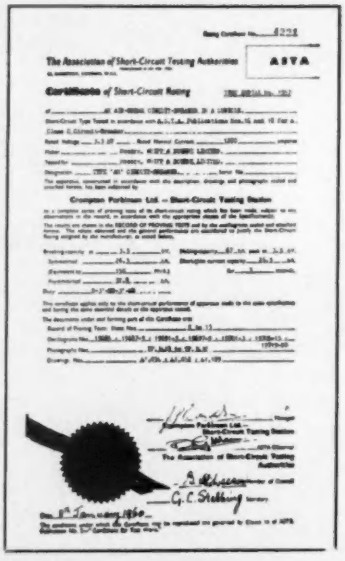

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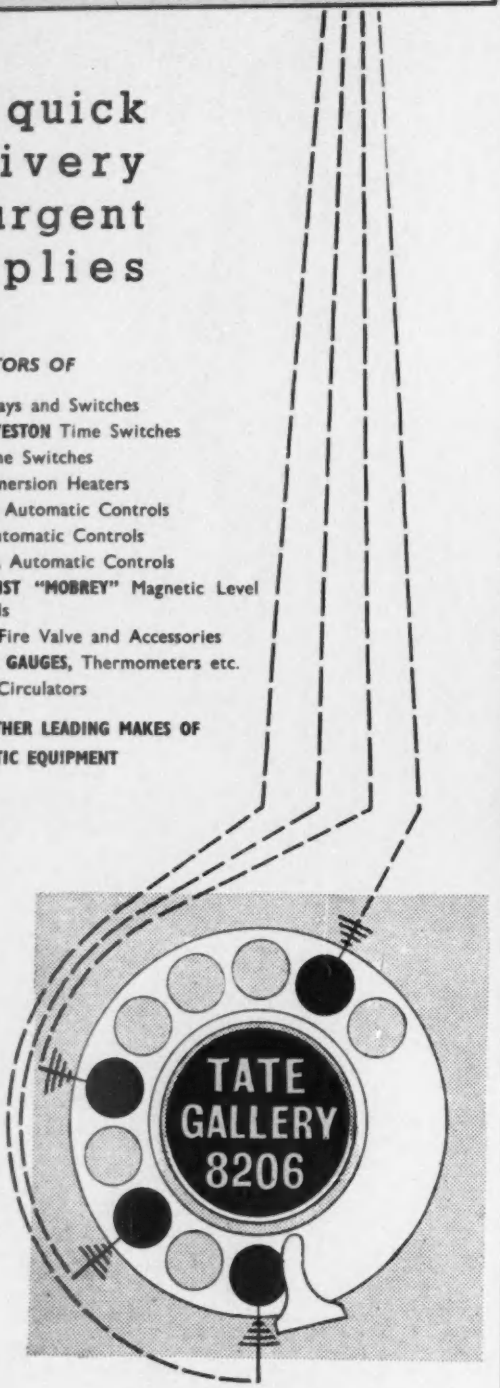

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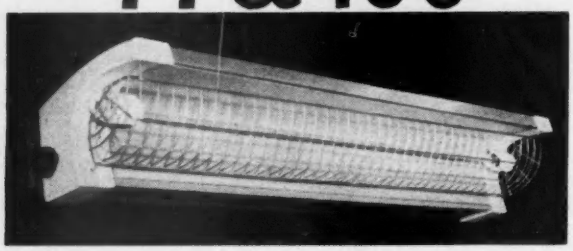

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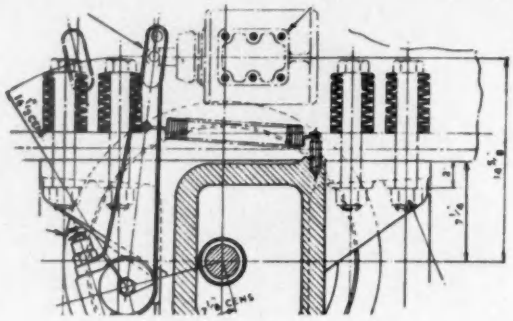

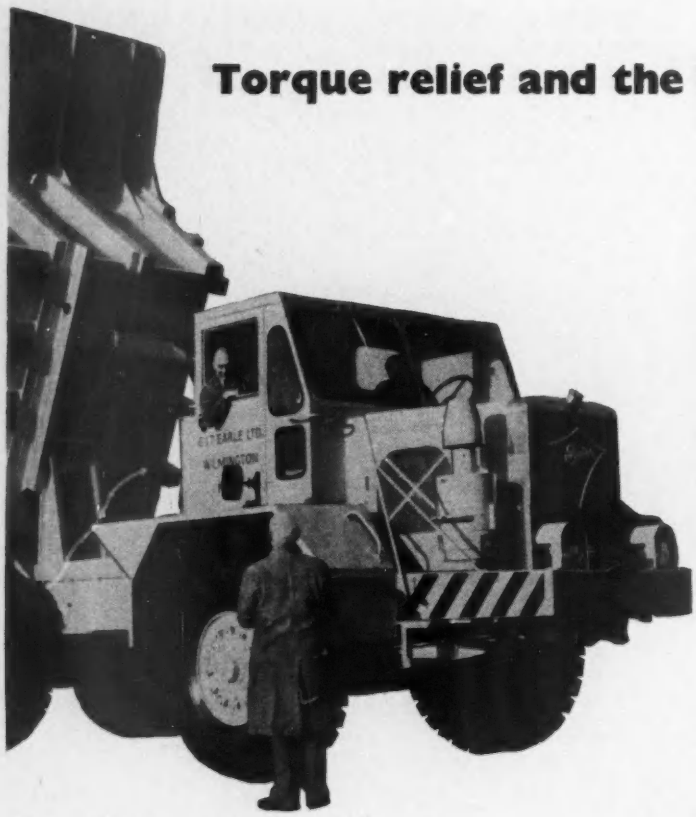

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Messrs. Fodens Ltd., fit Belleville washers in packs of 7 pairs on their F.R.6/45 Heavy Duty Dumper. This proved to be the most effective method of relieving twisting of the rear axle case produced by braking and transmission torques.

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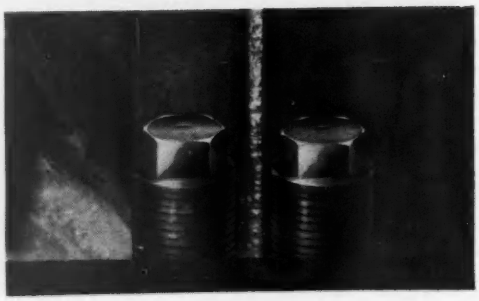

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ELECTRICAL TIMES

SARDINIA HOUSE, SARDINIA STREET, LONDON, W.C.2
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Solid Aluminium Cables—Part 2 125

Torpoint Ferry-boat Electrics 130

Glasgow Trains—Transformer Failure Investigation 131

Digital Computers for Supply System Calculations ... 133

Progress in Manufacture—South Wales Switchgear 139

Car Electrical Systems 140

Standardisation Progress 141

New Zealand's Generation Plans 142

Dans ce numéro

Câbles en aluminium massif, 2ème partie: pose ... 125

L'un des besoins auxquels devait répondre la conception des câbles "Solidal" était que le mode de raccordement habituel leur fût applicable. Cette condition a été remplie, comme l'indiquent les instructions relatives aux raccords. On a aussi mis au point des procédés plus simples, tels que la soudure, le sertissage et l'agrafage mécanique. Un raccordement sous tension effectué sur des câbles concentriques implique l'emploi d'un fil de fermeture du circuit, afin de préserver la neutralité du fil neutre pendant l'operation. Si un défaut d'isolement amène un courant à circuler dans un câble "Solidal", ce dernier résiste efficacement auz forces d'éclatement les plus intenses qui soient susceptibles de s'exercer sur lui.

Calculatrices digitales pour l'étude des réseaux d'alimentation 133

On peut se servir de calculatrices électroniques digitales pour l'étude d'un réseau d'alimentation si ce réseau est défini par une série d'équations simultanées reliant les courants, les impédances, et les voltages aux barres omnibus. On préfère généralement les calculatrices digitales aux analyseurs de réseau pour les études de stabilité, mais les ingénieurs ne s'entendent pas toujours sur la valeur qu'elles présentent pour l'étude des écoulements de charge. On peut se servir de calculatrices pour trouver automatiquement la "meilleure" solution à apporter à un critère donné.

Equipement électrique pour automobiles 140

C'est de réseau de génération et de distribution d'électricité d'une automobile qui alimente l'allumage, le démarreur, l'éclairage, les indicateurs de direction et, dans certains cas, la commande de la transmission automatique. L'équipement à 12 volts, d'usage standard en Grande Bretagne, a atteint une sûreté de fonctionnement élevée. Parmi les perfectionnements récents, on relève le prolongement de la durée utile des batteries et l'amélioration des régulateurs de tension. Transistors et alternateurs joueront aussi leur rôle par la suite.

In dieser Nummer

Ganzaluminiumkabel, Teil II—Anschluss 125

Für die Entwicklung der "Solidal" Kabel war der Gesichtspunkt massgebend, die üblichen Kabelanschlussverfahren anwenden zu können. Wie aus den Anleitungen für Kabelanschlüsse hervorgeht, ist dieses Problem zufriedenstellend gelöst worden. Darüber hinaus sind einfacherere Verfahren unter Berücksichtigung des Lötens, Krimpfens und mechanischen Anklemmens entwickelt worden. Bei Anschlussarbeiten an unter Spannung stehenden konzentrischen Verbraucherleitungen muss ein Überbrückungsdraht verwendet werden, um den Nullfluss aufrechtzuerhalten. Bei Fehlerstrom halten 'Solidal" Kabel mit Sicherheit dem stärksten Berstdruck stand, der in der Praxis überhaupt vorkommen kann.

Digitalrechner zum Untersuchen von Stromversorgungsnetzen 133

Elektronische Digitalrechner können zum Untersuchen von Leitungsnetzen verwendet werden, wenn die Netzanlage eine Reihe Simultangleichungen aufweist, die Strom, Impedanz und Spannung an den Sammelschienen verbinden. Man ist der allgemeinen Ansicht, dass Digitalrechner für Stabilitätsuntersuchungen den Netzanalysatoren vorzuziehen sind; jedoch sind die Techniker unterschiedlicher Meinung, ob sie sich vorteilhaft zum Untersuchen der Strombelastung eignen. Digitalrechner sind für die "beste" automatische Ausarbeitung eines gegebenen Kriteriums geeignet.

Elektrische Anlagen im Automobil 140

Die elektrische Stromerzeugungs—und Stromverteilanlage liefert Strom für Zündung, Anlasser, Beleuchtung, Richtungsanzeiger und in einigen Fällen für die Betätigung der automatischen Übertragung. Das in England genormte 12 Volt-System hat einen hohen Zuverlässigkeitsgrad erreicht. Unter den letzten Entwicklungen befinden sich Batterien mit längerer Lebensdauer und verbesserte Spannungsregler. In Zukunft werden Transistoren und Wechselstromgeneratoren auch eine Rolle spielen.

D

FEATURES

Readers' Views 132
Notes on Wiring *by Megohm* 135
Personalities in the Industry 136
New Products and Appliances 144
Power Supply Statistics for December 147
News of the Week 148
Overseas News 154
Company Activities 156
Commercial Information 157

News Sheet 21
Classified Advertisements 45
Index to Advertisers 52

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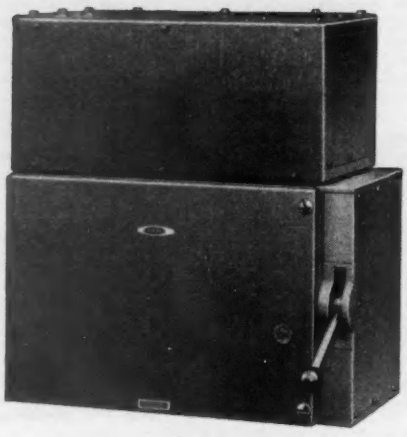

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ELECTRICAL TIMES

ESTABLISHED 1891

THURSDAY, 26 JANUARY, 1961

Editor and Managing Director:
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K. C. POUNDS, B.Sc.(Eng.), A.C.G.I., A.M.I.E.E.

News Editor:
T. W. WRIGHT

Comment

STEPPING UP EXPORT EFFORT

Urgency is again a discernible note in discussions of export trade and it is good to find that the electrical industry, for so long one of Britain's most successful overseas sellers, is taking practical steps to meet developing needs in this field. Export considerations have loomed large in the thinking behind many of the amalgamations the industry has experienced in recent years, and on many occasions realisation that strength in exporting may lie through the packaged deal has led to formation of ephemeral consortia to tackle large contracts. Now an attempt is to be made to spread economy of scale in overseas representation to cover smaller orders involving smaller firms. A BEAMA scheme plans to bring together companies interested in joint selling overseas, with the particular intention of establishing the smaller firm more positively in the export pattern. Co-operation is most clearly a possibility when firms making complementary, but not directly competitive, products are willing to share agents, combine for exhibitions and share the cost of market investigations. A brokerage arrangement in this sphere stands to achieve much to the good of the industry and the country. It is a commendation of the idea that one national newspaper is sponsoring something of the same sort for industry generally. Both schemes have the Government's blessing; but does the President of the Board of Trade think this is enough? Industry's efforts to bring a new upsurge in overseas selling need to be helped forward by Government steps not only in services but also in the climate of administration in such fields as taxation and monopoly law, so that while direct subsidy is avoided, initiative is not made unduly costly or made to appear morally opprobrious.

NO CHEERS FOR H.P.

No one is very enthusiastic about the new hire-purchase relaxations. A few weeks ago we suggested that any changes would be geared to cars, and however the three-year period may help such high-cost goods, it offers little aid to electrical appliance sales. Roughly, the extra year of repayment means no more than a reduction of a shilling a month for every pound paid on initial deposit; hardly sufficient on which to build an aggressive sales drive. Even these terms are too much for finance houses, for with the excessive caution that comes from burnt fingers they are continuing to insist on two years' repayment for appliances costing less than £30. The most that can be hoped from this Government relaxation is a better buying climate and this, reinforced with the low price tags that are

now fixed to many of the larger appliances, may help towards a thinning of stocks in the pipe line. Certainly, the decision means that there is no immediate hope for any reduction in initial deposit terms, the one factor that would really help, and it would seem that only in the event of further worsening of economic conditions is the Government likely to move. The next hurdle may well be purchase-tax. A change in emphasis from direct to indirect taxation is being canvassed and although there is little new in this advocacy the signs are propitious. But any raising of indirect taxes is more likely to come from widening the tax bracket than from raising tax levels on electrical appliances.

COMPUTING SUPPLY NETWORKS

Discussion of last week's IEE papers on digital computers in network analysis inevitably involved comparisons between the digital computer and the more familiar network analyser as tools for the system design engineer. The papers themselves, though widely welcomed as additions to the sparse British literature on the subject, suffered from the very speed of advance in computer design, although the principles they described seem not to have been vitiated. But the remarkable advances in speed of operation and memory capacity achieved and promised by computer designers do not seem to have swung the decision conclusively in their favour for all system design calculations. Transient stability calculations are generally accepted as a "natural" for the computer, though even here dissentient voices are to be heard. For system design and load flow studies, however, there are some intangible advantages in the conventional network analyser which are attracting engineers to continue its use. It is known that digital computers increase sharply in cost as the complexity increases of the system they are required to analyse in given time and these machines do not, with present arrangements, generally speaking, work at their best unless the essential design of the system they are calculating has been established by other means, unless it is "well conditioned." This is a challenge to the computer designer, since decision-making through applied logic is, even more than numerical accuracy, the strong point of their equipment. Perhaps, as one speaker in the discussion suggested, development will be even more successful when engineers have ceased to think of the computer as a replacement for the analyser, and in consequence have reshaped the problems they present for solution.

RAILWAY SYSTEM CLEARANCE

The damage that has been caused to the reputation of British engineering by the Glasgow train failures must not be minimised, but prompt publication of an interim report by the Ministry of Transport inspector should act to minimise the effect. Contrary to initial indications, the cause of the trouble has been proved to be overcurrents, occasioned by rectifier backfires and control gear failures, which have imposed greater electro-mechanical forces on the transformer windings than they could sustain. Voltage breakdown has followed mechanical distortion. The malfunctioning of auxiliary equipment has been corrected; but all too emphatically, the inadequate mechanical strength of the transformer windings has been demonstrated, measured against the occasional unusually heavy currents that must be expected in traction service. A replacement design has been drawn up and plans made that will enable trial running of the modified trains to begin during March, and preliminary inspection has shown that the same trouble is not likely to be present with other manufacturers' designs of 50 c/s multiple stock. Out of the whole investigation there comes a general statement that should be hammered home. Despite the intense investigation, no evidence has come to light to indicate that failure of the transformers is in any way due to special conditions arising from the dual high voltage a.c. electrification system used. This is of first importance, and it must be hoped that the verdict will be confirmed for the less alarming Eastern Region train troubles, for which the cause has yet to be determined. Even though manufacturers may have judged wrongly on design details, basic principles of the British electrification system are cleared.

SPREADING STANDARDS

Standardisation in all its spheres has been growing in significance over the past decade, with more and more bodies entering the field with standards designed to cut down duplication of design and ensure reasonable interchangeability. The numbers of British Standards hammer home the story. At the end of 1950, new standards were taking numbers around 1,660; the most recent publications bear identifications in the 3,320 region. To the completely new standards must be added many extensive revisions, so far as BSI is concerned, and a continued spread of interest beyond the engineering field once primarily involved. As this change at home has developed, international standardisation has had to receive increasing attention as well, although, thanks to the activities of the British pioneers in the field, the electrical industry got away to a good start there, through the International Electrotechnical Commission now 56 years old. Extending export trading has given heightened significance to the international standards' work, not only at the general technical level covered by the IEC and by the complementary International Standards Organisation, but also in the more homely details of safety construction with which the members of CEE concern themselves. With such developments, it is appropriate that standardisation should be accorded increased attention in our pages, and this week readers will find the first of the occasional reviews we plan, to keep them informed, in more detail than in the past, of the way work in standardisation is progressing.

Meteor

This week's quick summary of electrical news faces advertisement page 20

Solid aluminium cables

PART 2 – INSTALLATION AND JOINTING

IN the first part* we dealt with the design aspect of "Solidal" cables. We shall now discuss installation and jointing techniques.

It was a prime requirement of design that no special skill over and above that for installing conventional distribution cables should be needed for handling the new cable. As we shall see, that requirement has been satisfied, but simpler methods of jointing, by soldering, compression and by mechanical clamps, have been devised.

"Solidal" cables are suitable for installation in almost any condition other than those of excessively high ambient temperature. This limitation is imposed by the choice of p.v.c. for insulation and is shared by other cables using the same material. Apart from its lightness in handling, the cable is not difficult to bend, despite the solid conductor. Fig. 2 shows the bending loads measured with apparatus as in Fig. 3 compared with wire-armoured, paper-insulated copper cables of similar conductor cross-section. This relative ease of manipulating is important in cable-laying as it can considerably reduce labour costs by cutting down the time required for the installation of the cable. The Midland Electricity Board, who has used "Solidal," reports savings in time of up to 66% in cable-laying.

There is, of course, a limit to the amount of bending which the cable will withstand without harm, and during installation it is advisable not to pull around radii of less than eight times the cable diameter.

In regard to the lightness, while this reduces the number of rollers which may be required when drawing into long trenches and the pulling tensions necessary, it does mean that the cable may not lie "dead" on the rollers under its own weight and more frequent directional guidance may be required than with heavier types of cable. Braking on the pay-off drum is often helpful. There is also a low temperature limitation in laying, which is due to the lowered ductility of the p.v.c. insulation at around freezing point (0°C). As with all plastics-insulated and covered cables, they should not be installed when the ambient temperature is at or below this temperature or unless both cable and ambient have been above freezing for at least 24 hours. If cable-laying at sub-zero temperatures is unavoidable, precautions must be taken to ensure that the cable insulation is initially appreciably above 0°C and that the temperature is artificially elevated prior to laying—as, for example, by passing current through the cable from a low-voltage transformer.

* ELECTRICAL TIMES, 1 December, page 831.

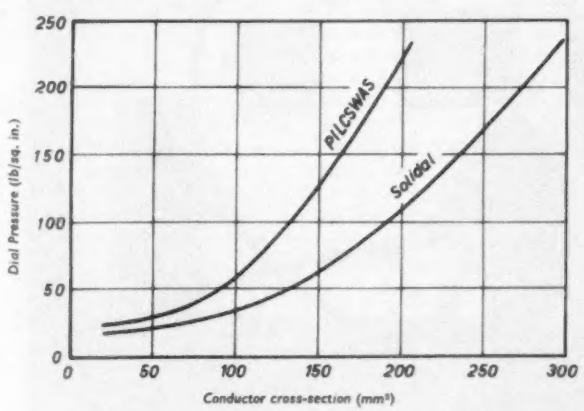


Fig. 2. Graph showing relative bending loads for paper-insulated and "Solidal" cables of similar conductor cross-section

Fig. 1. Manipulating a "Solidal" feeder cable from underground ducts into a substation building
(Midland Electricity Board)

Underground Installation

"Solidal" cables are suitable for direct burial in the conventional way and no special precautions are necessary. Should the outer plastics sheath be perforated or scuffed during laying, it should be repaired before back-filling. It is also good practice to see that the earth in the immediate vicinity of the cable is sifted free from stones and well tamped down to ensure good heat transfer and to avoid subsequent subsidence.

When installing in ducts, the latter should first be carefully pulled through with a ball of waste to ensure freedom from dirt and snags. Any tendency to "drag" in this operation should be taken as a suspicion of rough joints which could damage the plastics outer sheath. The use of a lubricant when pulling into long or sinuous ducts is also recommended to reduce pulling loads. Straight pulls can be executed by applying a stocking grip over the end of the cable serving but, where heavy pulls are anticipated, it is advisable to apply the load to a pulling eye soldered to all three conductors. It is, perhaps, unnecessary to add that the entrance to the ducts must be padded to prevent chafing of the p.v.c. outer sheath during pulling.

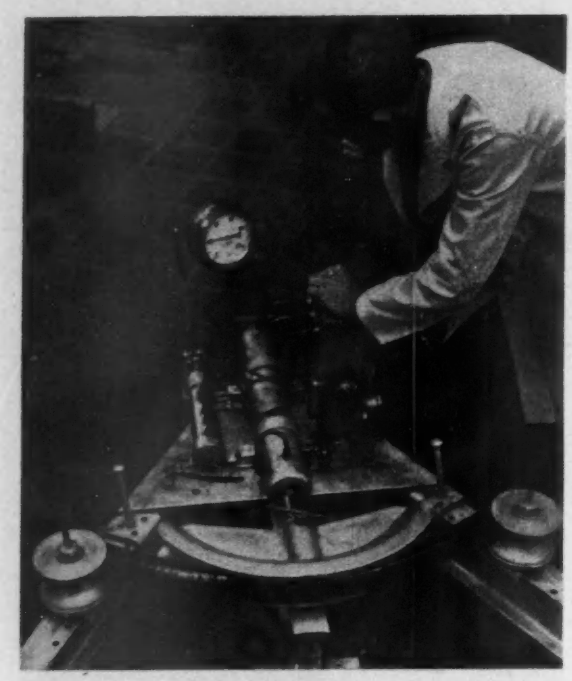


Fig. 3. Testing the bending load for "Solidal" cables on a special machine. The results are recorded on the previous page

Installation above Ground

Installation above ground on racks or cleats presents no special problem. As with all cables when cleated, the cleats must grip the cable firmly but not excessively. Enough sag must be left between adjacent supports to allow for contraction without tension at the lowest ambient temperatures which may be experienced. For conditions in this country, and assuming a normal ambient temperature of 15°C whilst laying, a sag of about 2% of the length between supports is usual. In countries where exceptional sub-zero temperatures are to be expected, this figure should be increased.

"Solidal" cables are ideal for aerial installations. The light weight and good tensile strength enable them to be supported without catenary wires from poles in short-lengths. They can be installed on building façades sometimes at lower cost than conventional three- and four-core insulated wire systems. For medium and long spans, catenary wire support is essential.

JOINTING

Despite the fact that problems of soldering aluminium conductors had been solved before the "Solidal" concept was initiated, it was always assumed that the new cable could only justify itself if it could be jointed easily, quickly and inexpensively; in fact, more easily and at less cost than for conventional cables.

The use of p.v.c. insulation simplifies jointing. There are no metallic sheaths to be sweated or plumbed, nor is there any chance of a joint failing through the presence of moisture entering a pin-hole or porous casing. The p.v.c. insulant, therefore, offers inherent advantages over paper as used in cables and, appreciating this, every attempt was made to ensure that the advantage was not discounted by other adverse aspects of design. A large number of experiments were mounted in the programme on jointing carried out by Aluminium Laboratories Ltd. at Banbury before the final recommendations were made. In particular, the decision to employ a concentric neutral was dependent upon the development of jointing techniques which were uncomplicated and easy to apply.

Jointing procedure falls into two parts: connecting the conductors and reinstating the insulation. Methods advocated in the light of experiments are all suitable for "live" jointing; in particular, service connections.

Preparing the Cable

The first step, either in straight-through or tee-jointing or in terminating, is to prepare the cable and/or cable ends. The following is a recommended practice. Mark off the outer p.v.c. sheath to the required length for stripping and apply a binder of tape at each mark. Actual length is a matter of choice but, for straight-through joints or terminations, 10 in.—or slightly more for the larger cables—is usually sufficient, with 12 in. to 18 in. for tee-joints.

Next, with a sharp knife, make a cut around the p.v.c. sheath at each mark, taking care not to completely pierce the sheath. Cut the sheath longitudinally from end to end between the marks and peel off around the circumferential cuts. Cut and remove the chromate tapes, if present, and then the aluminium equalising tapes.

The next step is for making a tee-joint and concerns the

Fig. 4. Laying a "Solidal" cable in an open trench to supply a Midlands housing estate

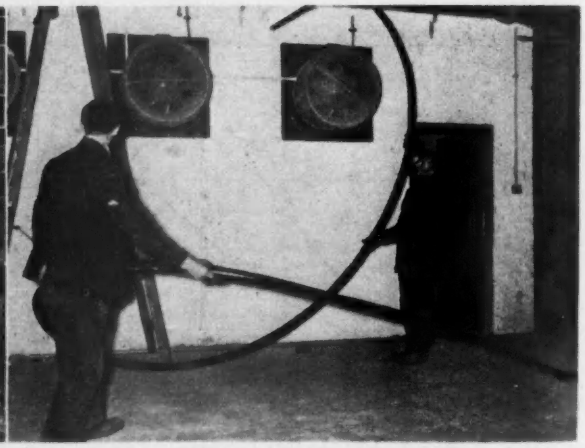


Fig. 5. Installing a "Solidal" cable in a factory. The lightness and ease of manipulation is evident

main cable. Assuming the joint is being made on a live distributor, the first precaution is to ensure continuity of the concentric neutral during the jointing process. This may be done by applying a special jumper, comprising clamps and an interconnecting cable, to the neutral conductor, the clamps being placed as close as possible to the cut sheath. It is imperative that no attempt be made to sever the neutral sheath until the alternative path through the jumper has been established.

Mark off the centre of the joint and carefully cut through the neutral armour wires at this point, taking care not to damage the underlying bedding and insulation. Bend the strands back to expose the bedding; cut and remove the bedding to within ½ in. of the bent-back neutral strands and continue by removing the "Melinex" tapes to the same point, so exposing the cores. Separate the cores by wedges. Similiarly, prepare the end of the service cable and position for jointing.

Jointing Methods

Four methods of jointing are available, all of which have been applied with success to conventional cables. They are: (a) low temperature soldering; (b) fusion welding; (c) compression jointing and (d) mechanical jointing. The choice of method must be at the discretion of the individual engineer and will depend mainly on that with which the jointers are accustomed. All have been tested and shown to be sound, both electrically and mechanically.

Low temperature soldering, by far the most common practice with cables, using organic flux and solder-basting techniques, fluxless soldering with abrasion solders or reaction flux and torch or resistance heating are all adaptable to "Solidal" cable without any special features. Solders and fluxes are readily obtainable from the usual suppliers. In Britain, Fry's Metal Foundries have developed a complete range of soldering materials for "Solidal," including an odourless flux which can be used in conjunction with their low temperature aluminium solder. Specially shaped ferrules are not necessary with "Solidal" cables; standard weak-back ferrules are easy to apply and can be formed around the sector conductor with little difficulty.

Fusion welding methods result in higher jointing temperatures. It is, therefore, necessary to cut the insulation back rather more than necessary with other methods, which makes for a long joint, a disadvantage where dimensional limitations are imposed by the form of joint box being used.

Compression and Mechanical Jointing

Compression jointing is undoubtedly the most rapid method and, of course, it necessitates the least skill. Aluminium ferrules, of the same core profile as the conductor and produced by extrusion to finished size, are available and these make the jointing of even the largest cables possible with a compression tool of no more than six tons capacity. Such tools are of the hydraulic type, operated by a hand pump and are easily portable. The compression form recommended is of the indent type, using dies of appropriate form and size. The same tool can be used for terminating in lugs.

Mechanical jointing, using bolted clamps or terminals,

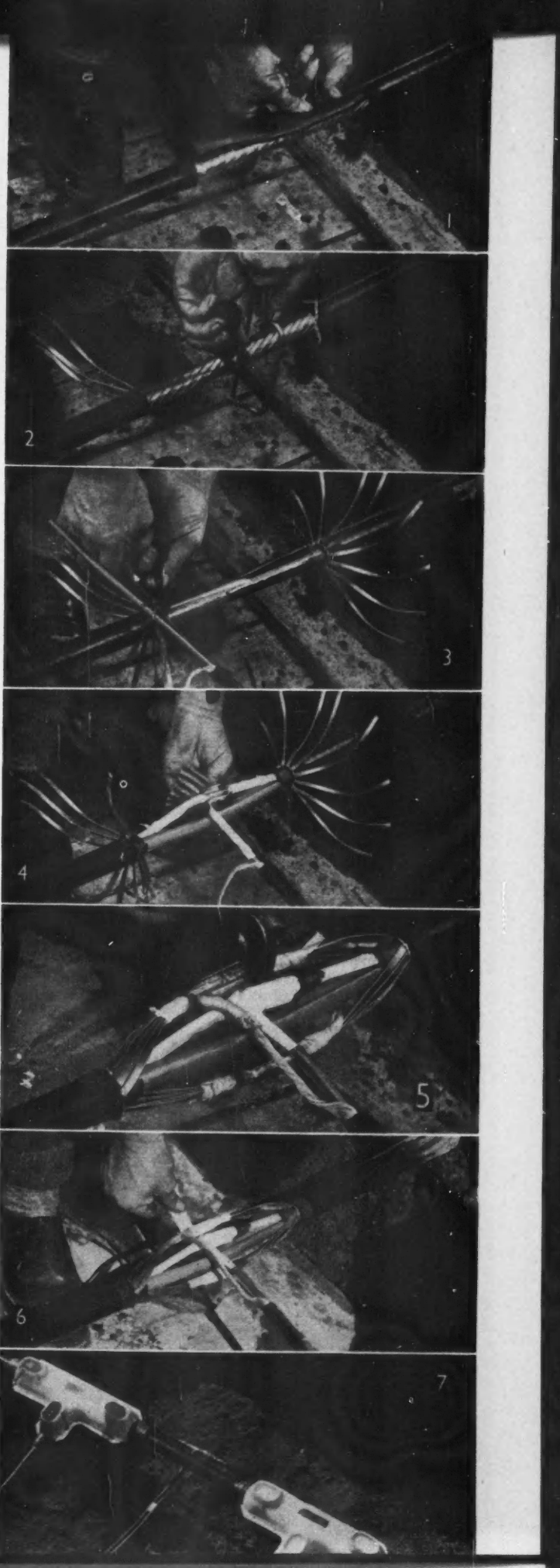


Fig. 6. Stages in the jointing of a "Solidal" cable. 1, Stripping back the p.v.c. sheath; 2, Cutting the neutral armour wires. Note that this joint is being done on a "dead" cable and a jumper is not necessary; 3, Removing the bedding; 4, Making the conductor joint prior to soldering; 5, Making the neutral joint. Note the continuity joint in the foreground; 6, Taping up the neutral joint prior to fitting the joint box; 7, The completed joints. The extra cable shown is the earth continuity cable of the system which, in this case, does not employ p.m.e.

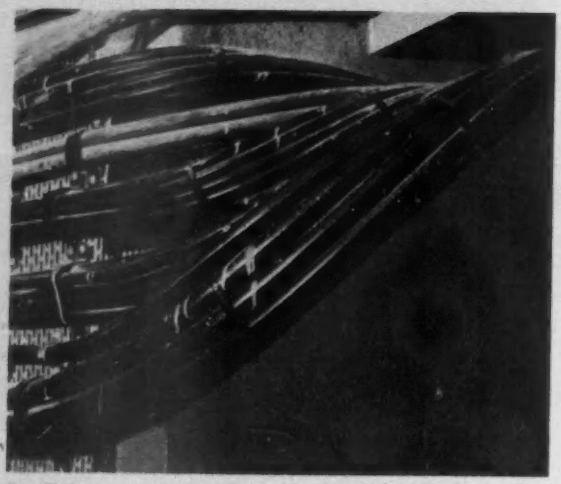


Fig. 7. This view of a factory installation of "Solidal" cables clearly demonstrates the self-supporting characteristics of the cable

is an acceptable alternative to compression jointing in remote areas or where the number of joints which have to be made does not justify the cost of compression tools. The solid form of the conductor makes it a simple matter to secure excellent and reliable contact, such as would not be possible, except with extreme care, in similar circumstances with a stranded conductor. With bolted connectors, the use of an inhibiting compound is recommended. A suitable compound comprises 5% zinc chromate in 87% "Esso" M.P.L. grease with the addition of 8% titanium dioxide to inhibit oxidation of the grease. Such a compound is marketed by Messrs Winn and Coales Ltd., of Denso House, Chapel Lane, London, S.E.27, under the trade name of "Densal."

Concentric Neutral Jointing

After jointing the main conductors, the continuity of the neutral armouring can be re-established by dividing the strands of each neutral into separate bunches, inserting the ends in suitable weak-back or solid ferrules and completing the joint by soldering, compression jointing or with specially designed bolted clamps. The additional length for such a joint is provided by the unwinding of the lay in the armouring wires. Similar methods are used for terminating the neutral at a service joint box.

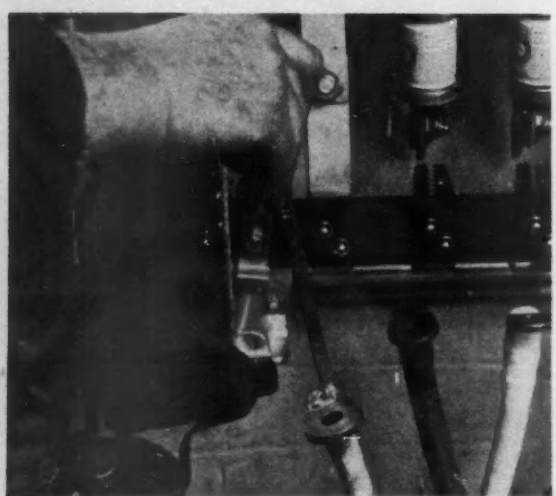


Fig. 8. Terminating "Solidal" cable conductors by soldering

It is, of course, not necessary to employ the jumper if working on dead cables. After jointing, all cores, including the neutral, are insulated by tape and properly spaced apart for enclosure in the selected form of joint box prior to filling with the suitable bitumen compound or resin filling as for conventional cables. Where concentric neutral cables need to be married into existing systems not employing permanent multiple earthing, it may be necessary to install a separate earthing cable.

Terminals

The termination of "Solidal" conductors in equipment terminal boxes, busbar chambers and domestic and industrial service panels may be by the ordinary types of lug attached by soldering or compression techniques. In addition, "Solidal" cables lend themselves to a unique terminating procedure, "Pressterms," in which the solid aluminium conductor is pressed into terminal lug shape in a set of dies and drilled to take the terminal stud. As with all aluminium lugs, thick parallel faced steel washers must be inserted between the holding-down nut and the lug face to distribute the load and prevent the softer metal from being damaged by the nut during tightening down. Before bolting down, the contact surfaces of the joint must be scratch-brushed under an inhibiting compound. (Fig. 10.)

Service Connections

For single-phase service connections, "Solidal" cable is in the form of a single core concentric neutral pattern otherwise similar to the multi-core cable but with a

TERMINATION FITTINGS

NOM. CURRENT	SOLDERED FERRULE SIZE	INDENT STRAIGHT FERRULE	INDENT RIGHT ANGLE FERRULE	BOLTED (STRAIGHT)
75	·0025in.			
100	·06in.	100ETC 5/16	100ELC 5/16	100ETB 5/16
150	·10in.	150ETC 3/8	150ELC 3/8	150ETB 5/16
200	·15in.	200ETC 3/8	200ELC 3/8	200ETB 3/8
250	·25in.	250ETC 3/8	250ELC 3/8	250ETB 3/8
300	·3in.	300ETC 1/2	300ELC 1/2	300ETB 1/2
400	·5in.	400ETC 1/2	400ELC 1/2	400ETB 1/2

NEUTRAL FITTINGS

NOM. CURRENT	SOLDERED FERRULE SIZE	BOLTED END TERMINATION	BOLTED STRAIGHT THROUGH & T.J.
75	·0225		
100	·04	100 NEB	
150	·075	150 NEB	150 NST
200	·10	200 NEB	200 NST
250	·15	250 NEB	250 NST
300	·20	300 NEB	300 NST
400	·30	400 NEB	400 NST

Note: The above tables list all the jointing accessories based on the development programme carried out by Aluminium Laboratories Ltd. of Banbury. Most of the items are in production by Erma Ltd. and other

circular section phase conductor. The termination at the consumer's end does not involve any special problems.

The joint between the service conductor and the main cable conductor can be a normal soldered one or, alternatively, a cheap and effective joint can be made with a claw-clamp type of mechanical connector which simultaneously grips the distributor conductor and the service conductor. A schedule of jointing and terminating accessories for "Solidal" cables, developed and/or in production to date, is given in the tables.

Joints Between "Solidal" and Other Cables

"Solidal" cables can, of course, be jointed to p.i.l.c. or other types of cable with either aluminium or copper conductors. In so far as the jointing of the conductors is concerned, soldering is the recommended practice.

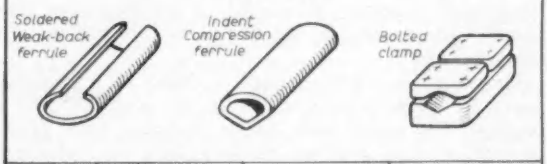
For p.i.l.c. cables, traditional cast iron joint boxes can be used with a special mechanical gland to take the "Solidal" cable, the sheath of which is built up to be a snug fit in the gland. For filling, low temperature bitumen compound, such as G.101 (BICC) or Henley 57005 (AEI), is the preferred choice.

Cast iron joint boxes may also be used when jointing between "Solidal" and other plastics-insulated cables is being carried out. Alternatively, any one of the many forms of plastics joint box with appropriate casting or filling resins may be used.

Short-circuit Performance

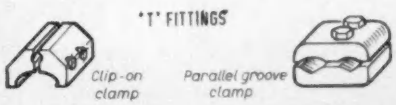
Evaluation of the short-circuit performance of cables is not an easy task. Modern distribution systems, with their

S/T FITTINGS



NOM. CURRENT	SOLDERED FERRULE SIZE	INDENT	BOLTED
100	·06	F 100	100 STB
150	·10	F 150	150 STB
200	·15	F 200	200 STB
250	·25	F 250	250 STB
300	·30	F 300	300 STB
400	·50	F 400	400 STB

'T' FITTINGS



CLIP-ON		PARALLEL GROOVE		PARALLEL GROOVE	
NOM CURRENT	CAT No	NOM CURRENT	CAT No	NOM CURRENT	CAT No
100-75	100-75TC	100-75	100-75PG	300-75	300-75PG
150-75	150-75TC	100-100	100-100PG	300-100	300-100PG
200-75	200-75TC	150-75	150-75PG	300-150	300-150PG
250-75	250-75TC	150-100	150-100PG	300-200	300-200PG
300-75	300-75TC	150-150	150-150PG	300-250	300-250PG
400-75	400-75TC	200-75	200-75PG	300-300	300-300PG
150-100	150-100TC	200-100	200-100PG	400-75	400-75PG
200-100	200-100TC	200-150	200-150PG	400-100	400-100PG
250-100	250-100TC	200-200	200-200PG	400-150	400-150PG
300-100	300-100TC	250-75	250-75PG	400-200	400-200PG
400-100	400-100TC	250-100	250-100PG	400-250	400-250PG
		250-150	250-150PG	400-300	400-300PG
		250-200	250-200PG	400-400	400-400PG
		250-250	250-250PG		

manufacturers of "Solidal" components, who will have their own catalogue numbers. The laboratory reference number given above will, however, be recognised if the relevant catalogue number is not known

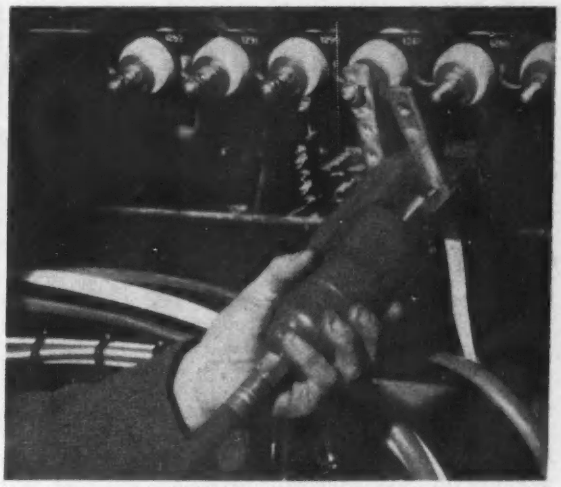


Fig. 9. Terminating "Solidal" cable conductors with lugs applied by crimping with a hand-hydraulic tool

differing protective systems, have widely varying characteristics. Fault currents, formerly considered as rarely exceeding 20 times maximum load current and persisting for periods of 1 sec to 5 sec, are today superseded by concepts of up to 100 times but limited to a few cycles' duration. The effects of either on a cable are vastly different. Whereas the former introduces cable stresses which are mainly thermal in effect and affect the insulation, the latter bring into play mechanical forces of such magnitude as to displace the conductors and/or disrupt insulation and even the outer sheath. Burst cables under particularly high fault current conditions are by no means unknown.

With "Solidal" cables, however, tests have been carried out to establish its ability to withstand the severest conditions possible under current test methods. These have shown that, because of the compact construction and solidity of the cores, it is extremely strong against bursting forces; in fact, it is unburstable within the limits of current likely to arise in practice. The thermal limits imposed by the choice of insulation are, therefore, the only ones which need be considered in service.

The next and final section will deal with manufacturing techniques and, we hope, will be of interest to all cable-makers who are manufacturing, or contemplating the manufacture of, "Solidal" cables.

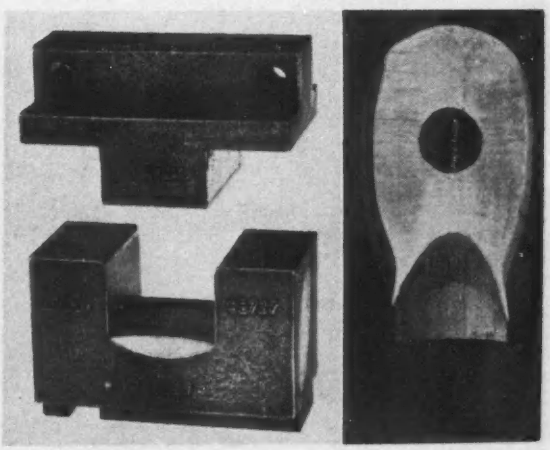


Fig. 10. A set of dies for forming the solid conductor end into an integral lug. When drilled, the finished termination appears as a "Pressterm"

Torpoint ferry-boat electrics

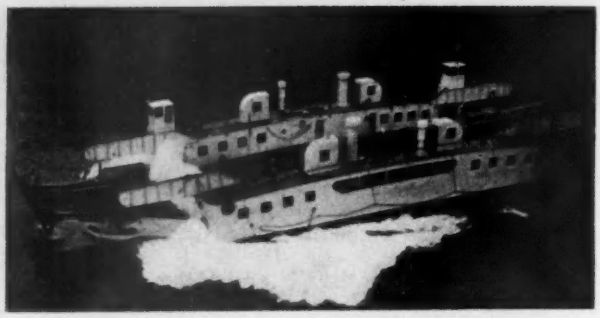


Fig. 1. Launching one of the new Torpoint ferries

DIESEL-ELECTRIC propulsion, giving a top speed of 6¼ knots, has supplanted steam as the motive power for the new boats now operating on the Torpoint-Devonport ferry. Car drivers on the A38 from Bodmin to Exeter, who in the past may often have been downcast by first sight of a mile-long queue as they approached Torpoint, will also be heartened to learn that the new boats have had their capacity increased from 26 to 36 average size motor-cars.

The two ferry-boats were officially handed over to the chairman of Cornwall C.C., Sir John Carew Pole, by J. I. Thorneycroft, the boat builders, on 11 January, although one of the ferries had then already been in operation for about a month. The propulsion unit and associated machinery were supplied by GEC and includes three diesel generator sets.

Propulsion Units

Between Torpoint and Devonport, the River Tamar is half a mile wide and the ferry-boats pull themselves across the water along chains laid on the river bed. The chain wheels, one on each side of the boat, are driven by a 250 h.p. d.c. 440 V separately excited motor through a gearbox and couplings. The motor top speed is 500 r.p.m. and the gearbox ratio 25:1. Sliding couplings allow the chain wheels to be disengaged if necessary, and hand turning gear can be used to turn the wheels when teeth segments need replacing.

Power for the main motor is normally supplied from one of three diesel generator sets, although to obtain maximum power two of the sets are used. A Ward-Leonard speed control gives seven speeds in either direction and incorporates provision to prevent overload of the propulsion motor. Each generator set consists of a 114 kW 220 V generator driven by a National horizontal diesel engine which also drives a 35 kW 220 V d.c. generator for auxiliary power supplies.

In normal service only one set is used, with another as standby, while the third can be shut down for overhaul. Electrical interlocking prevents more than two of the three generators being connected to the propulsion motor at a given time. A three-field system of generator control is used to prevent overloading due to mishandling of the controller. Other protection equipment includes an overload set well above the normal working current and earth leakage protection.

Auxiliary power is normally provided by one of the three 35 kW generators through a seven-position switch and a double busbar switchboard. Although the busbars can be fed from separate generators if required, they are interlocked to prevent paralleling of the generators. The switchboard can also be supplied from a 10 kW standby generating set.

The ships' auxiliaries include a single 20 h.p. geared motor for prow hoisting and a 16 h.p. motor driving a capstan. The prow hoist motor operates both prows through a main gearbox, shafting and two subsidiary gearboxes. The function of the capstan is to assist in the maintenance of the main guiding chains.

The Torpoint ferry-boats have overall hull lengths of 102 ft and their beam is 54 ft. They are controlled from three cabins, one at each end of the deck and one in the engine-room.

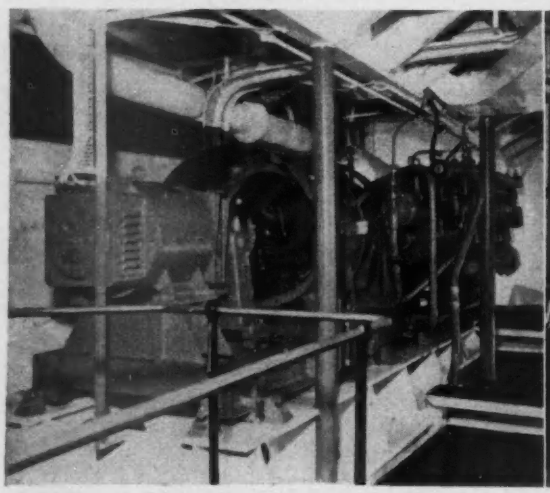


Fig. 2. One of the three main diesel-generator sets. Only one is required in service, with one as standby and the third available for maintenance

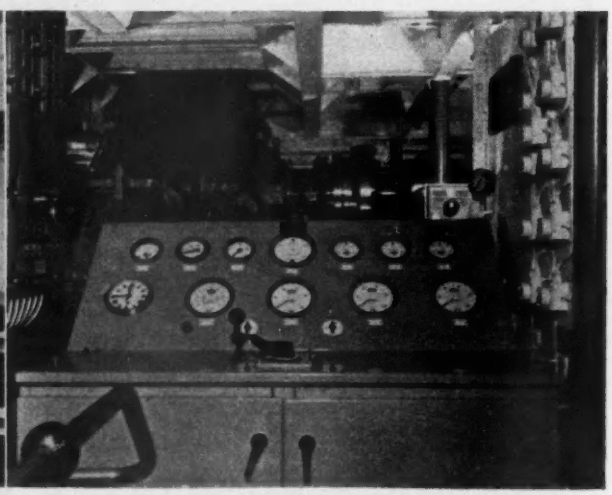


Fig. 3. Engine room control desk. The alarm panel is on the left while the main propulsion gearbox and clutch are behind

Glasgow Trains—Transformer Failure Investigation

RECTIFIER BACKFIRES REVEAL WINDING WEAKNESS

SEVERE electro-mechanical distortion of transformer secondary windings was the main cause of the series of breakdowns affecting Glasgow suburban electric multiple unit stock. This was the conclusion reached by the BTC in consultation with Mr F. J. Lane, of Messrs Preece, Cardew and Rider, in the course of investigations into possible causes of failure. Details are given in an interim report to the Minister of Transport concerning accidents which occurred as a result of certain of the failures; the report follows a public inquiry held just before Christmas. It will be recalled that since immediately before inauguration of the new train service in November last year, there were, in all, five incidents involving overheated transformers. These culminated in the incident on 17 December, when it was decided to withdraw all stock from service pending the current investigation. An account of the inquiry was published in the ELECTRICAL TIMES on 5 January, 1961.

Preliminary Examination

Following the first two incidents of breakdown, the damaged transformers were removed for inspection together with four other transformers, chosen at random from stock in service, having no history of failure. The units were stripped down and examined by engineers of AEI, makers of the equipment, in the presence of BTC representatives. The transformer primary is cylindrically wound in four sections. Underneath is the secondary, having four layers intersected with oil passages and wound round the central limb of the transformer core. Examination of the damaged units revealed no abnormality in the primary windings. By contrast, the secondary was found, in each case, to have been extensively overheated, the paper insulation on the outer turns having been burnt away. The turns themselves were distorted and some of them were fused together. In the case of the transformers selected at random, both primary and secondary windings were found to be quite intact.

Results of these preliminary investigations had seemed to point to prolonged overheating, due to stoppage of oil circulation, causing winding insulation failure. This theory was subsequently abandoned following tests carried out on the oil-circulating system. These showed that with circulation reduced to a quarter of its nominal rate of 50 g.p.m., the windings reached a full load equilibrium temperature rise of 65°C. This was well within the specified maximum of 75°C. Even with flow completely stopped, the temperature rise was only 69°C after 25 min.

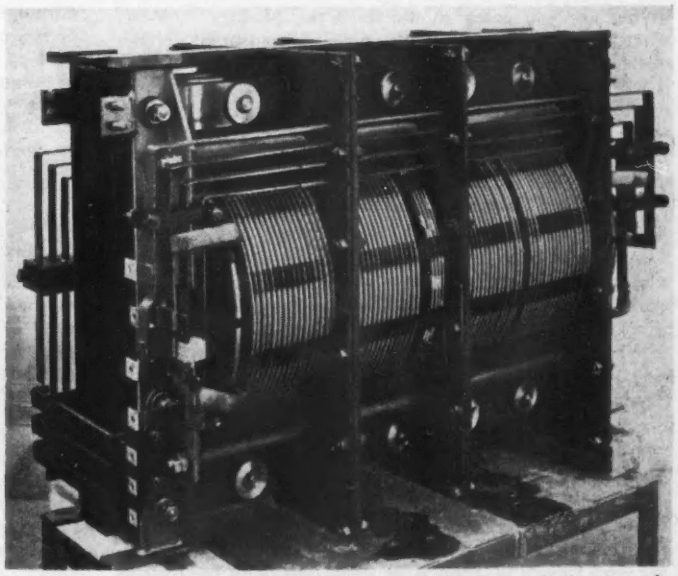
The first substantive clue that cause of failure was not due to overheating of the secondary insulation came to light when the transformer damaged on 14 December was examined. In this instance, although the windings had been badly distorted, it was noticed that there was no sign of burning of the outer winding insulation. Nor were there signs of general overheating. Instead, damage was confined to localised areas of inner layers, where the familiar fusing and burning of insulation had taken place.

Overriding Turns

A week later, another transformer declared to be suspect was examined. Here, serious displacement of the secondary winding assembly had taken place, with turns overriding one another. Although there was scuffing of the paper insulation due to overriding, there was no sign of overheating having occurred. It became obvious that displacement had been caused by severe electro-mechanical forces developed under conditions of heavy current surge. Furthermore, it was clear from the condition of the winding that electrical breakdown must have been imminent immediately prior to the transformer being withdrawn from service. The conclusion was therefore reached that electro-mechanical distortion was the main factor initiating winding breakdowns observed in the other transformers examined.

Rectifier Backfires

The physical nature of the winding breakdowns having been more or less established, the next step was to investigate possible circumstances. It was at this stage that earlier reports of backfiring of the mercury-arc rectifying equipment became significant. These backfires had occurred in the initial running stages of the Glasgow suburban train



Typical winding assembly of transformer for Glasgow suburban multiple unit stock. This type has now been withdrawn for design modifications

service and had been traced to overheating of the rectifier tanks due to a defective ventilating system. This was subsequently put right by AEI. It was apparent that the effect of backfiring (equivalent to a direct short-circuit across the transformer secondary) plus short-circuits due to control gear failure, also reported in the early stages, must have substantially contributed to the mechanical stressing of the damaged windings. A further circumstance of failure was the possible occurrence of transient over-voltages due to rectifier "current chopping" and other circuit conditions, but there was no evidence of insulation damage having resulted from this cause. Nor had there been any evidence so far, that failure of the transformers was in any way connected with the use of a dual-voltage catenary supply system.

It was finally agreed by BTC and AEI representatives that the circumstances of failure were typical of onerous working conditions likely to be met with by traction equipment. It was also agreed that the transformer secondary windings were not strong enough to meet such conditions and should be redesigned accordingly.

Following this recommendation, a modified transformer design had already been accepted in principle. The windings are to be made up of a series of "pancake" primary and secondary coils, suitably interspersed, the secondary turns having a more rigid type of construction than those of the original design. Alteration of the transformer oil circulating system is also intended and this will include changing the position of the oil pump to ensure that all parts of the system are at a pressure greater than atmospheric. For safety reasons, the size of all vent pipes will be increased in diameter and conservator tanks mounted on the outside of the motor coaches.

Preparations for substituting modified transformers for the original ones was actively in progress, but the task was a formidable one and, although trial running of the first units was expected to begin in March, the work would take several months to complete. Although the full resources of both the Manchester and Rugby works of AEI would be concentrated in rebuilding the transformers, no accurate forecast could be made at this stage as to when public train services would be resumed.

Readers Views

Correspondents writing under pseudonyms are asked to submit their names and addresses in confidence to the Editor

13 Amp Plugs

YOUR correspondent, Mr R. Harvey, suggests that manufacturers should supply 13 amp plugs without fuse links, and leave the onus on the installer or retailer.

Very often in the case of a new property, the user is not available to consult, and indeed often not known when the installation is complete. In this event Mr Harvey's solution may sound practicable, but it still does not get over the problem of what size fuses should be fitted by the user, as he seldom has the slightest idea on the subject, except that a fuse may be required and perhaps a piece of any good fuse wire may be inserted.

In our experience, the greatest problem arises in the showroom when a customer wants several of "those plugs with square pins." The inevitable conversation then ensues. "What are you going to use them on, Madam?" "Why, what has that got to do with you?" A condensed version of Ohm's Law follows. Then—"Well, what make of toaster is it?" "Has the fire got one bar or two?" "Is it a small wash boiler or a large one?" "Has the washing machine got a heater?" etc., etc., etc. Meanwhile the queue of waiting customers grows larger, and finally two plugs are sold at 3s 3d each, and an irate lady announces that she will send her husband in to deal with us.

We sometimes wish they had a good old fashioned 5 amp 2-pin plug, they would put a bit of 30 amp fuse wire in the fuseboard carrier, and make whatever it is work. Unfortunately, our electricity is "in safe hands."

G. C. Swain,
SWAIN ELECTRIC,

Heat Pumps for Offices

I HAVE read Mr Skelcher's letter with interest (ELECTRICAL TIMES, 29 December) and the release of additional information does justify the analogy in my earlier letter (20 October).

Mr Skelcher agrees that conclusion II in his committee's report might have referred specifically to continuous heating, and I think that this is an important point to stress as the majority of office buildings in this country do not require continuous heating, which is uneconomic for an office block occupied only nine or ten hours per day.

Mr Skelcher makes no comment on the figures which I gave for Carliol House although the committee has adjusted figures both up and down for purposes of comparison. I think in the circumstances I might repeat them but scale them down to the heat loss of Meaford "A."

According to the North Eastern Electricity Board, the average consumption of the past few years has been 1,788,200 kWh per annum, and the heat loss is 1,035 kW, for a temperature rise from 30° to 66°, and an internal temperature of 66° is maintained day and night through the 30-week heating season.

Applying this information to an office building of the size of Meaford "A," with a heat loss of 96 kW, one arrives at an annual consumption of 166,000 units. It now appears that, in the Table IV of the Report, the unit consumption used for arriving at the running costs was 618,000 units or 3·7 times the results obtained over many years by the North Eastern Electricity Board.

The overall cost in Table IV is made up of:

618,000 units at 0·85d	=	£2,188
Annual capital charges based on 212 kW load	=	£674
		£2,862

Using the information available from Carliol House and reducing the kilowatt loading to the necessary figure:

166,000 units at 0·85d	=	£588
Annual capital charges based on 145 kW	=	£460
		£1,048

On this basis the relative annual cost becomes 0·69d compared to the figure of 1·0d for bled steam, the lowest cost mentioned in the Report.

There must be something wrong with someone's statistics if one area electricity board can heat a building with exactly the same system, i.e., electrode boilers, hot water storage and embedded pipe coils, for 27% of the units used by a division of the CEGB.

J. C. Edwards,
DIRECTOR, BASTIAN AND ALLEN LTD.,

Digital computers for supply system calculations

PRESENT AND FUTURE POSSIBILITIES DISCUSSED

HOW digital computers of comparatively modest size may best be used in the analysis and study of power supply networks was considered at a meeting of the IEE Supply Section last week, when two papers* on the subject were presented. These papers have much in common, but they are concerned with different sizes of computer, and a divergence of opinion exists between the authors as to the attractions of digital computers as compared with analogue computers (network analysers).

Prof Humphrey Davies and Dr Gupta consider that:

> The main object of the work was to examine the suitability of existing digital computers for carrying out power system studies of a type normally performed on network analysers . . . once suitable programmes have been prepared, digital computers are more economical and efficient.

In contrast, the claims of Mr John for digital computers are comparatively modest:

> Provided special consideration is given to the development of programmes suitable for smaller, slower computers, it is felt that they can be of considerable use in the solution of routine network problems, and also as analytical tools in the investigation of conditions for which analogue investigation may be inadequate . . . scope exists for the employment of such computers even if access to a network analyser is normally available.

The paper by Prof Humphrey Davies and Dr Gupta refers to work carried out with a Pegasus I computer, which has a 7,168 word store, and which they describe as a medium-size computer, comparable in cost with a network analyser. In a study of a power system on this digital computer, the network is represented by a number of equations expressing the net current flow into or out of each busbar in terms of the voltages at that and other busbars, and the admittances between the various busbars.

One busbar is nominated "floating" and the equations solved to bring the condition at this busbar to a known value; effective currents in various branches, for example, being adjusted until the required balance is obtained. The computer used can represent a system with 33 busbars and 120 lines.

Computer Programme

The paper describes the working of a programme in more detail than can be attempted here. Assuming a programme for a load study to have been prepared, and data to have been punched on tape for the various lines, generators and transformers comprising the system, the computer carries out solutions of the resulting equations for a limited number of cycles, then if the required result is not obtained, modifies some of the conditions, e.g., transformer tappings or reactive power generation by a particular generator, and tries again.

In the calculation system used, one busbar is selected to supply losses and other requirements unknown at the start of the computation. The mathematical approach used is known as matrix inversion. The main problem arising is organisation of a control programme that will automatically adjust the network if a satisfactory solution is not being obtained.

In one study detailed in the paper, a 28-busbar system is involved. A solution was obtained after one cycle but this gave voltages that were too low, so adjustments were made automatically. Breakdown of time used for the computation was:

Input of programme tape	2 min
Input of system data tapes	1 min 20 sec
Computation	9 min
Output	2 min 10 sec
	14 min 30 sec

The first cycle of operations (which included the complex mathematical operations) took about 4½ min, and each subsequent cycle iteration about 15 sec.

For transient stability studies, it is necessary to undertake subsidiary calculations to obtain coefficients which can be fed into the machine, because the storage space is not sufficient to allow these to be automatically included in the computation. Time taken to compute and print out one set of coefficients for a 33 busbar system with 14 machines was 7 min. Thereafter, calculation of rotor angles, for example, in stability studies, may be relatively fast. Moreover, significant generator characteristics commonly neglected in analyser studies may be allowed for. Examples are saliency, flux decrement, positive sequence damping, voltage-regulator action, and governor action.

Dr Gupta and Prof Humphrey Davies conclude their paper, after expressing the views already quoted, with the statement that they do not regard the programmes described in their paper as more than prototypes. With larger computers, it should be possible to present a more general mathematical formulation of complete supply systems problems, covering both steady-state and transient conditions simultaneously.

Small Computer Technique

Mr John bases his work on experience with a computer having a magnetic drum as its main store, with a capacity of 4,096 words of 32 bits each. For a 13 busbar load study of a system which he says is particularly sensitive to reactive power requirements, he gives a total time of 141 min, involving 44 cycles. A short-circuit study, covering faults at two busbars in turn, took 76 min.

Commenting on these study times, Mr John remarks that an approximate time for overall time for different systems is given by the ratio of the number of busbars

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* Paper 3259: "A General Method of Digital Analysis Particularly Suitable for Use With Low-speed Computers," by M. N. John, B.SC., A.M.I.E.E. (formerly Metropolitan-Vickers, now UKAEA); and Paper 3484: "Digital Computers in Power System Analysis," by P. P. Gupta, PH.D., B.SC., GRADUATE I.E.E. (formerly Queen Mary College and AEI, now Ferranti Ltd.), and Prof M. W. Humphrey Davies, M.SC., M.I.E.E. (Queen Mary College).

involved. Times one-fifteenth of those quoted have been found possible with a large high-speed computer. Relative costs of the two types of computer, and of a large modern network analyser, are reckoned as of the order 1:7:5.

Studies on a computer may not give the same results as are obtained with a network analyser, because of differing sensitivities about reactive power generation, depending on the busbar chosen as the reference. However, this may not matter a great deal, since system studies usually have as their purpose the comparison of different system conditions. The digital computer seems particularly suitable for this type of work.

The mathematical approach adopted by Mr John reduces the storage requirements compared with the method of Dr Gupta and Prof Humphrey Davies, and maintains closer physical correspondence with the power system. It is known as the Gauss-Seidal iterative process, and is combined with use of acceleration methods to reduce the number of computing cycles necessary to obtain convergence to a solution of the network equations.

Mr John foresees further digital computer developments as being directed towards self-balancing programmes involving use of large high-speed computers, which may compete successfully with analogue methods for many classes of problem. He suggests that the methods developed in his paper may provide the basis for such work.

DISCUSSION

Mr J. G. Miles (AEI) commented that it was only four years since the first British paper on use of digital computers in network analysis was published. Progress in the field was fast, so it was to be expected that there should have been many improvements subsequent to preparation of the paper. Both the papers discussed computers which were small by present-day standards. Mr John, having the smaller machine, had been much concerned with accelerating convergence in solving the network equations. Today much was known about conditions that caused difficulty in this respect; they were: any network arrangement which gave rise to low values of self-admittance at any busbar, and any operating condition which approached the region of voltage instability. A fully generalised digital computer programme should have the ability to deal with these difficulties, and also to handle small changes in the system quickly.

Mr D. G. Hawkins (CEGB) spoke from experience with the CEGB Deuce computer, followed by some months with an IBM 709. It was desirable that, in setting up any problem on a digital computer, there should be clarity about what was to be done; but there was usually insufficient time for this. In the long run, however, it would probably prove worth while taking time to write down a general programme. On the IBM machine, a 50 node calculation took only four minutes, including write-out.

Mr K. C. Parton (GEC) discussed experience with a Mercury digital computer used in conjunction with a large Blackburn conjugate network analyser. Many difficulties arising with direct analogues disappeared with the Blackburn design. If calculations were being carried out without a digital computer on the spot, and programmes did not converge first time, so requiring some adjustment to system conditions, progress could be very tedious. Commenting that most speakers regarded the "ideal" programme for the digital computer as that which did everything, including adjustments to the system, he advanced the contrary view, that the computer should be used to present an accurate analysis, while the designer was left with the synthesis of the system to carry out, by making adjustments to the system on the basis of information printed out after each calculation on the digital computer. If this was done, the designer got the "feel" of the system. Left alone, the computer might design a system near the limits of voltage instability, without this being apparent to the designer. For extensive system problems, he thought that network analysers would hold the field for some time to come. Mr D. A. Newey (GEC) extended the comments on using a network analyser and computer in parallel.

Dr P. D. Aylett (Ferranti) commented that the new high-speed computer was bringing about a revolution in analysis techniques. The machine described by Mr John was very slow; machines were now being designed which would execute an instruction 10,000 times as fast as his computer. Our approach to system calculation was built up on the basis of the network analyser as the design tool; the outlook would no doubt change as familiarity with digital computers increased, and as the high-speed machine became increasingly used. He believed that too much attention had been given to the production of numerical results. The most striking ability of the digital computer was that of choosing between alternatives. Thinking must be written into the programme.

Commenting on the programme advanced by Dr Gupta and Prof Humphrey Davies, he said one of its difficulties was that all the incidental losses not specifically provided for appeared at the "slack" busbar, which might accordingly have completely misleading generation. A method was under development for distribution of these losses between the generation on the system, as would be done with a network analyser. For transient stability studies, digital computers were a "must." He called for programmes requiring the computer to maximise some factor, such as minimum transmission of reactive power, or minimum losses.

Mr Marique (CPTE, Brussels) spoke of Belgian experience on load flow calculations, and described a technique for spreading losses unknown at the beginning of the work between many busbars rather than concentrating them at one.

Mr D. G. Taylor (EE Co.) discussed the relative advantages of the mathematical approach in the two papers, suggesting that for very large systems the technique used by Mr John might be preferable. He felt that more comprehensive programming was a better long-term aim than more frequent interference by the design engineer to modify the system.

Mr T. W. Berrie (CEGB) said that many of the comments about slowness of convergence and voltage stability were involved with whether the network being analysed was "well conditioned." If a well-conditioned network was presented to a digital computer, a good solution was obtained. In small systems (up to about six machines) stability studies could best be carried out by a network analyser simulator; beyond that, a digital computer was needed. He did not like the idea of bringing into stability studies effects such as saliency and governor action in any simple way. Results could be misleading unless every mechanical and electrical factor was taken account of. Of all methods of network analysis available today, he suggested that the network analyser was the cheapest way of carrying out a calculation. He was in favour of using the computer to take over from the designer simple decisions about network modification.

Mr. Marchand (S of S EB) spoke of experience with a small network between 5% and 10% the size of the UK system. He thought that for this an analogue simulator technique had much to offer; and for all except transient stability studies, the network analyser was best. For a 50 c/s conjugate analyser, he suggested 40 minutes for setting up, 15 for balancing and 10 for readings.

Mr A. Brameller (AEI) dealt with mathematical techniques modifying the techniques put forward in the papers, as did Mr M. D. Bakes (GEC).

Dr J. R. Mortlock (AEI) spoke of the cost of computers. A Pegasus machine cost about £50,000 and produced a solution to a 30 node problem in about 900 sec. A Mercury cost £150,000 and solved a 60 node problem in 1,000 sec. For an IBM, capitalised cost of hire was £1½ million, and it produced a 60 sec solution to a 50 node problem. So it looked as though to double the number of nodes solved in given time cost three times as much; or that cutting time to one-tenth added a nought to cost for the same number of nodes. He did not think digital computers were as yet anywhere near fast enough to be incorporated in system operating practice.

NOTES ON WIRING

BY MEGOHM

MY recent reference to immersion heaters seems to have interested many engineers, although I merely mentioned them in connection with controls and economic running, etc. It seems that such heaters are a problem in more ways than one, and certain engineers are pressing for some further thoughts on the sub-circuit serving an immersion heater.

It is fairly common practice to supply a heater from a spur box on a ring-circuit, and someone informed me this week that in some areas (especially in council houses) the heater is served from a 13 A socket on the ring-circuit through an ordinary plug. This, I consider, is bad engineering practice, for I know some manufacturers are not entirely happy with 3 kW fires on ring-circuits.

I have not personally come across an immersion heater served in this way and would certainly not agree to the arrangement on any of my work. Apart from the bad arrangement, such a method would give the user a wonderful chance of using the socket for other purposes. Imagine the hot tank being sited in a bathroom and the immersion heater being served by a plug and socket! I am presuming that such situations do exist for, in the main, tanks are sited in bathrooms.

I feel that the time has come when the IEE Regulations should be revised to encourage the installation of a separate circuit for the immersion heater, and ensure that such a danger as suggested above be eliminated. I know that I am not alone in this matter; the idea will have the backing of many engineers.

Diversity in Houses

I mentioned the problem of diversity in houses recently and an electricity board engineer friend of mine revealed during a conversation that in some areas the mounting load of the ordinary household was a major problem. Not only, I understand, from a distribution and demand aspect but from the increased calling-out of service men to repair the board's fuses. As I understand it, if the fuse blows due to faulty apparatus a charge is made, and if the damage is due to some trouble other than faulty apparatus, then there is no charge. However, it appears that recently so many calls have been made to repair fuses which blow due to overloading that all such calls are now being charged for.

I have for some time now commented on the rising loads in domestic premises and feel that if something is not done now we shall see chaos within the next few years. Domestic appliances are not likely to decrease in variety and numbers and, in fact, greater efforts are being made now by manufacturers to persuade the housewife that electricity is indeed an excellent servant. And the people who assist these manufacturers most of all are the colleagues of those who have this problem coming to them.

Cure?

Is one cure for this overload trouble the miniature circuit-breaker which is coming rapidly into the domestic field? Since the introduction of a household unit fitted with m.c.b's the ordinary householder has shown great interest in the development. I judge this partly by the number of people who have questioned me on their advantages. One simple advantage is that m.c.b's deal with an overloaded circuit in such a manner that the load must be lightened before a supply can be had on that circuit, and it is quite impossible to tamper with the breaker to raise the tripping limit. In estates and council property, the extra cost of m.c.b's over fuses should, I think, prove an economy in the long run.

It is pleasing to note (and significant) that many fusegear manufacturers will supply their own cases fitted with m.c.b's, and this does assist the engineer who considers that certain circuits should be protected by fuses and others by m.c.b's in one installation. Of course, the arguments for and against m.c.b's will long continue.

Hospital Building Programme

An announcement in the popular Press recently foretells of a bigger building programme for hospitals. The overall amount to be spent is raised and so is the cost level at which Ministry approval has to be granted. However, I note that much of the money will go in "modernisation and re-building." I fear that the modernisation of some of the present hospitals will prove costly—from an electrical point of view, anyhow. The installation of modern systems of lighting, communications and other services into old buildings is very hard work indeed for both planners and contractors. The electrical installations in many of our old hospitals are in a bad way. Years of use, lack of maintenance and continual additions and alterations have played havoc with the systems. It is only when a modernisation scheme is put forward that the snags show up, and as they show up the costs go up. Of course, an electrical installation in a modern hospital is an extremely important matter and very often a complicated one. There are, for instance, many types of patients' call systems available today and each one varies in requirements as far as the wiring-up is concerned.

Another medium is becoming more usual in hospitals, and that is close-circuit television used in operating theatres. I have it on good authority that this will become almost a "standard" within the next few years, and the manufacturers of theatre lamps have for some time now allowed for the installation of the necessary TV camera in their fittings. The possibility of colour TV in this sphere must not be ruled out, except that at the moment the cost is very high.

All of this really boils down to the question of whether or not it is a good move to "modernise" an existing building, both from the economic and practical angle. There is much to be said for the fact that the building is there already, but are these old hospitals really suitable for such an expensive face-lift? Is the result really worth it all? Would it not prove better to build anew and by doing so provide really first-class internal services and modern wards and rooms which can be kept clean, warm and aired at a fraction of the cost of trying to achieve such results in an old building? I feel certain myself that it would be.

Personalities *in the industry*

Mr M. A. Griffith-Jones

Mr F. D. Lowen

Mr C. W. Sadd

Mr R. J. F. Howard

Mr J. S. Clemo

Mr Morley A. Griffith-Jones, O.B.E., has been appointed general sales manager of Chloride Batteries Ltd., responsible for sales of all the company's products in the UK and overseas. He joined Chloride in December, 1959, having previously been with the Burco-Dean group of companies as sales director for five years. Earlier, he was with the North Thames Gas Board as sales manager to three of the Board's territorial divisions, during which time he read law and was called to the bar by Gray's Inn in 1950. Educated at Haileybury, he started with the Gas Light and Coke Co. in 1936 as an administrative staff pupil and received a thorough training in all aspects of the company's work.

The Uganda Electricity Board announce that the title of the appointment held by **Mr J. M. Stock,** O.B.E., M.ENG., M.I.C.E., M.I.MECH.E., M.I.E.E., has been changed from chief electrical engineer to chief engineer. **Mr L. Fergusson,** M.I.E.E., has been promoted from deputy chief electrical engineer to chief electrical engineer.

Mr F. D. Lowen has been appointed manager of the AEI light power motor factory at Thorne, near Doncaster, having been superintendent there since 1953. After being educated at the King Henry VIII Grammar School and the Technical College, Coventry, Mr Lowen began a five-year apprenticeship in 1935 at the BTH Coventry works. In September, 1940, he entered the Planning Department as a junior planning engineer. When, due to enemy air action, certain departments at the Coventry works had to be dispersed, he was transferred in February, 1941, to the Colne works to initiate the Moulding Department. Later the same year, the Nelson factory was taken over for the manufacture of aircraft magnetos and he went there to organise production. Mr Lowen served in the army from February, 1944, to March, 1946, and spent some time in India. On demobilisation he rejoined the Planning Department at Coventry works. In July, 1951, he was transferred to the Thorne works in charge of Production Planning Department and in 1953 was appointed factory superintendent, the position he held until his present appointment.

Previously a director of Leagrave Engineering Co., **Mr C. W. Sadd** has joined Oryx Electrical Laboratories Ltd. as general manager. Earlier he was works manager with Measuring Instruments (Pullin) Ltd.

Mr R. J. F. Howard has been appointed to the newly created post of director of marketing to Metal Industries Ltd. and will be primarily concerned with the co-ordination of the marketing activities of the electrical companies in the group. Mr Howard was previously a director of Lancashire Dynamo Electronic Products Ltd. He remains a non-executive director of that company and also joins in a similar capacity the boards of Brookhirst Igranic Ltd., Lancashire Dynamo and Crypto Ltd., Foster Transformers Ltd., J. G. Statter and Co. Ltd. and Lancashire Dynamo Nevelin Ltd. Educated at Whitgift Middle School, Croydon, Mr Howard gained early training with Harries Thermionics before joining the Mullard Radio Valve Co.'s technical department, where he was engineer-in-charge of receiving valve quality control and was subsequently concerned with valve application duties for military equipment. Later he transferred to Mullard Ltd. for studies of post-war industrial applications of electronic valves. He joined the development staff of the industrial electronics section of the English Electric Co. in 1945 and the following year took charge of the industrial electronic equipment development laboratory. He joined Lancashire Dynamo Electronic Products, then known as British Electronic Products, as chief engineer in 1947 and became a director in 1954.

Mr J. S. Clemo has been appointed to the board of Benjamin Electric Ltd. He joined one of that firm's associated companies as accountant in 1929 and became chief accountant of Benjamin in 1932. He will retain the latter position in addition to his new duties.

Mr D. T. Barritt has been appointed

To mark his retirement at the end of 1960 from the chairmanship of Holophane Ltd., Dr S. English, F.INST.P., *received a gold watch from the directors and senior staff. Our photograph shows the new chairman, Mr H. G. Campbell (right) making the presentation recently at the company's head offices. Dr English joined Holophane in 1927 as head of the Technical and Research Department, and although retired from executive work he is remaining on the board of the company*

deputy chairman of Simon Engineering. He has been appointed a director of its subsidiary, Henry Simon (Holdings) and becomes chairman on 1 March. He will relinquish his executive responsibilities and his appointment as joint managing director of Simon-Carves from that date, but remains a director. **Mr I. Hey** will relinquish the chairmanship of Henry Simon (Holdings) on 1 March for health reasons, but continues as a director of the company.

Formerly the Board's purchasing and stores controller, **Mr W. Hyland,** M.SC.(TECH.), M.I.E.E., A.M.I.MECH.E., has been appointed deputy manager of the Cardiff and East Central area of the South Wales Electricity Board. His successor as purchasing and stores controller is **Mr I. R. Lamb,** F.S.A.A., A.M.B.I.M., who has been a special assistant to the chairman and deputy chairman since April, 1958 (*ESH, pages 129, 132). Mr Hyland was educated at Manchester and, at the outset of his career, held successive engineering appointments with electrical manufacturing companies. He joined the staff of the former Electricity Department of the Cardiff Corporation in 1934 as technical assistant (mains). In 1941 he became chief technical assistant and held this post until nationalisation. On vesting date Mr Hyland was appointed as head of the Board's Purchasing Department, which in 1958 assumed responsibility for stores control. Mr Lamb became an assistant chief accountant at vesting date and has been a special assistant to the chairman and deputy chairman since April, 1958. Prior to vesting date he served with the Treasurer's Departments of the Newport Borough Council (1920-26) and Cardiff City Council (1926-48).

Mr J. P. V. Woollam has been appointed deputy chairman of Simon-Carves Ltd. **Mr L. Brook** has been appointed a director of the company and a member of the management board.

Following the regrouping of the Marconi Co.'s Aeronautical Division in new premises at Basildon, Essex, the following staff changes have been made: **Mr F. Wheeler,** formerly sales and contracts manager, becomes deputy manager; **Mr G. P. Parker** becomes manager, Engineering Co-ordination; **Mr L. R. Mullin,** chief engineer (Airborne Communications); and **Mr G. E. Beck,** chief engineer (Navigational Aids). Other new appointments are **Mr J. H. Gill,** service manager; **Mr E. Swinney,** systems manager; **Mr B. J. Infield,** sales manager; and **Mr C. A. R. Mackley,** contracts manager. Manager of the Aeronautical Division is **Dr B. J. O'Kane.**

Holophane Ltd. announce the retirement of **Mr G. Dixon,** A.M.I.E.E., A.M.I.MECH.E., formerly sales executive responsible for Government contracts. He is succeeded by **Mr W. H. Dodgson,** DIP.M.I.E.S., who has been with Holophane since 1954.

Formerly principal lecturer in the Department of Mechanical Engineering at the Borough Polytechnic, **Mr J. F. Douglas,** M.SC.(ENG.), A.C.G.I., D.I.C., A.M.I.C.E., A.M.I.STRUCT.E., has been promoted to head of that department in succession to **Mr G. L. H. Bird,** who recently took up an industrial appointment.

Formerly the service manager of the E. K. Cole group, **Mr E. W. Shepherd** has joined Beckman Instruments Ltd. as sales manager.

Mr H. D. Norris has joined Philips Electrical Ltd. as a lighting engineer in the south east region and **Mr M. H. Billett** has been appointed lamp and lighting group representative in West and North West London.

Previously a senior distribution engineer in the Regency district of the London Electricity Board, **Mr E. E. Cooper,** A.M.I.E.E., has been promoted to district engineer for the Board's Central district (*ESH, page 78).

Mr C. A. P. Cannon has been appointed to the board of Measuring Instruments (Pullin) Ltd. after 21 years' service with the company. He has also been created general manager.

Formerly director and general manager of the Brush Electrical Engineering Co. Ltd., **Mr R. G. Hooker,** J.P., is relinquishing that position at the end of this month to become deputy managing director of K. and L. Steelfounders and Engineers Ltd., one of the George Cohen 600 Group. Mr Hooker, who is 39, studied at Wimbledon Technical College and the Borough Polytechnic, and served an apprenticeship with Philips Electrical Ltd. In 1950 he visited America to study industrial management with one of the productivity teams sponsored by the Anglo-American Council on Productivity. He joined the Brush Group in 1951 and in the following year was appointed general works manager of J. and H. McLaren Ltd. He has been general works manager and director of Brush since Oct., 1954, and is also chairman of the Loughborough Productivity Association.

Sir Walter J. Wormersley has been re-elected president of Relay Services Association of Great Britain. Sir Walter has held this position since 1949. **Mr B. R. King** has been elected chairman of the Council. **Mr J. W. Kinsman** has been elected honorary treasurer of the association.

A part-time member of the North of Scotland Hydro-Electric Board from 1956 to 1959, **Mr W. Hughes** is among the six new life Peers announced last week.

After nearly 50 years' service with the company, **Mr W. Winter,** general works manager of C. A. Parsons and Co. Ltd., has retired. He became general works manager in 1955 in succession to **Mr G. Baker,** who is now managing director.

Mr C. B. Reynolds, sales manager, Parnall domestic appliances, Electrical Division of Radiation Ltd., has been elected an alderman for the borough of Walthamstow.

Mr Ll. Young, M.I.MECH.E., M.I.MAR.E., M.INST.F., has been appointed a director of Bailey Meters and Controls Ltd. As from 1 Feb. he will become director of engineering and relinquish the position of general manager.

Mr Peter E. M. Sharp, A.C.G.I., B.SC.(ENG.), A.M.I.E.E., general manager of Westrex Co. Ltd. since last July, has been appointed a director of the company. Before joining Westrex he was personal assistant to the managing director of the Troughton and Young group of companies.

Mr S. A. Clodd has been appointed to the board of E. K. Cole Ltd. He became works manager in 1950 and was made an executive director in 1957.

Mr S. Tudor has been appointed production manager of Alfred Ellison Ltd. He has previously represented the company in the North of England for the past 11 years, following 14 years on the drawing office and design staff of the associate company, George Ellison Ltd. Mr Tudor is succeeded in the North of England by **Mr J. K. Gascoigne,** who has for the past 2½ years served as technical sales engineer for Wm. Whitely and Sons Ltd., Foundries Division, Huddersfield. He was previously sales manager of Forcast Foundries Ltd. and, prior to that, production manager for Auto-Malleable Ltd.

Mr P. E. M. Sharp

Mr C. A. P. Cannon

*(*Denotes revision to the "Electricity Supply Handbook, 1960.")*

Mr W. R. May, Guildford district engineer to the South Eastern Electricity Board, was presented with a home workshop from the Guildford staff and his associates throughout Surrey, at a ceremony to mark his retirement recently. The presentation was made by **Mr I. R. Galloway,** district manager.

Mr R. H. Hazlehurst has been appointed Midlands area representative of Lumenated Ceilings Ltd.

Concerning our note last week on the reorganisation of the British Insulated Callender's Cables' overseas organisation in London, BICC now inform us that the territories for which **Mr A. F. Coventry** is responsible in his new appointment include the Far East.

Mr H. Richards has retired as chairman of Wolf Electric Tools Ltd., but retains his seat on the board of Wolf Electric Tools (Holdings) Ltd. His successor as chairman is **Mr Geoffrey M. Wolfe.**

Chairman of Head, Wrightson and Co. Ltd., **Sir John Wrightson** flew to India on Monday to visit the Durgapur Steelworks and call upon several important customers. He will also attend the inauguration of operations of the new company, Head, Wrightson India Ltd., in Calcutta.

Sir Joseph Latham, who retired as deputy chairman of the National Coal Board last year, has been appointed a director of Associated Electrical Industries. Sir Joseph is a director of George Wimpey and Co.

Presentations were recently made to two representatives of Edmundsons Electrical Wholesalers Ltd. on completion of 50 years' service with the company. They are **Mr C. F. Hutley** (who was presented with a television set) and **Mr S. H. Snell** (who received an electric fire, floor polisher, vacuum cleaner and other appliances). Mr Snell, who also received a tea service and cheque from his colleagues, retired at the end of December, while Mr Hutley is to retire on 31 May.

We noted on 12 Jan. the appointment of **Mr R. E. H. Bell** as home sales manager of Murex Welding Processes Ltd., in succession to **Mr H. Martin** who has retired, but unfortunately the firm's name was wrongly printed as Madex.

Former chief technical officer of the Telegraph Construction and Maintenance Co. Ltd., **Mr R. C. Mildner** has joined the Plastics Department of the Dow Chemical Co. Ltd., Michigan, USA, as a technical specialist in dielectric insulation for power and communication cables. He will be responsible for dielectric research aimed at improved performance of Dow plastics materials in all types of cables. Mr Mildner is well known for his work in high voltage and telecommunications cable development. He holds ten British patents on cable research and development.

Mr W. Bruce, of Thorn Electrical Industries Ltd. (Export Division), leaves England on 6 Feb. to visit Atlas Lighting agents in Africa. He will be visiting Nigeria, Ghana, Sudan and Egypt (UAR), and is due to return on 9 March.

The Yorkshire Electricity Board have taken the first steps in building a team in the chief accountant's department to effect the installation and operation of the English Electric electronic data processing system, to which we referred on 27 Oct. The assistant chief accountant in charge of the project will be **Mr C. W. Mortby;** his assistant on the planning side will be **Mr D. Nuttall,** B.SC., while **Mr F. Hamnett** is to be in charge of the operation side. Mr Mortby, who is 41, is at present a senior executive officer at the Treasury where, since 1958, he has had extensive experience on systems study, specification study and tender evaluation for Government computer installations, together with considerable experience on many and varied machines. Mr Nuttall has been statistician at the Board's head office since 1959 and is a member of the Board's team which reported on the feasibility of applying computer methods. Mr Hamnett is at present a principal assistant in the Board's Accountancy Department and a member of the computer feasibility team. He had extensive local government and war-time punched-card experience before joining the Board's accountancy staff at No. 2 sub-area.

Mr A. H. Young, deputy chairman, Edmundsons Electric Co. Ltd. (centre), makes the presentations to Mr C. F. Hutley (left) and Mr S. H. Snell (right), to mark their completion of 50 years' service with Edmundsons

Mr A. L. G. Lindley, chairman and managing director of the General Electric Co. Ltd., leaves London Airport on 28 Jan. to visit South Africa, and is expected to return on 13 Feb.

OBITUARY

Mr Harold D. Symons, chairman of H. D. Symons and Co. Ltd., died on 15 Jan., aged 79. He studied under Silvanus P. Thompson at Finsbury Technical College and, after initial experience in the cable industry, joined the old British Westinghouse Co. where he later worked with the late Sir Arthur Fleming on insulation development. Subsequently he left to become manager for the British interests of the Sterling Varnish Co., of Pittsburgh, but the need for electrical insulating materials in the 1914-18 war led him to join Mr Percy Good in founding the company which subsequently bore his name.

Mr P. K. Davis, M.I.E.E., divisional electrical engineer, Eastern Division, CEGB, died on 17 Jan., aged 62 (*ESH, page 54). An old Faradian, he held various posts with British Insulated Cables Ltd., G. V. Twiss and Partners, and Merz and McLellan from 1924 to 1932. He then joined the Electricity Board for Northern Ireland as mains superintendent and from 1936 to 1948 was superintendent, Outside Dept., Northmet Power Co. On vesting day Mr Davis took up an appointment as senior assistant engineer (transmission) with the Eastern Division and was engaged on transmission contruction work. He was later promoted to transmission engineer. On the amalgamation of the transmission and technical (electrical) work of the Division in 1959, he was appointed divisional electrical engineer.

Mr F. H. Brandreth, formerly resident engineer to the Urban Electric Supply Co. Ltd., which operated around Grantham, Lincs, has died, aged 80.

Lt-Col G. S. Marston, D.S.O., M.C., M.I.E.E., formerly chairman and managing director of Lancashire Dynamo Holdings Ltd., J. G. Statter and Co. Ltd. and of Minerva Mouldings Ltd., died on 22 Jan., aged 68. He was co-founder of J. G. Statter and Co. in 1920. In 1956 the company became part of the LD group and subsequently he was chairman and managing director until the merger with Metal Industries Ltd. early in 1960.

Mr H. B. Mellor, A.M.I.E.E., of Power Department, AEI Birmingham district office, died on 15 Jan., aged 55.

Mr J. W. Papworth, A.M.I.E.E., formerly resident engineer to Lanarkshire County Council electricity undertaking, died on 21 Jan., aged 84.

Mr T. J. Brook, B.E.M., purchasing manager of Watford Electric and Manufacturing Co. Ltd. from 1950 until retiring in Dec., 1959, has died, aged 66.

SOUTH WALES SWITCHGEAR LTD.

Progress in Manufacture–1960

THE past year has been marked by considerable extensions to the company's manufacturing, research and development facilities. At the Treforest transformer factory, expanded floorspace has enabled larger units to be designed and manufactured, the range having been extended to 15 MVA at voltages up to 88 kV. At Blackwood, where the new research and development centre is rapidly nearing completion, additional testing facilities will include impulse, power frequency overvoltage and heavy current, while the laboratories will be able to undertake X-ray examinations, noise-level investigations, mechanical studies and chemical analysis and research.

The laboratories will also play an important part in the expansion of switchgear developments into the 132 kV field, and already a new line of circuit-breakers, in ratings up to 2,500 MVA, is available; 11 kV and 33 kV switchgear has been developed a stage further and the ranges extended, while the "packaged substation" can now alsc be supplied in capacities of 500 kVA and 750 kVA for normal distribution systems.

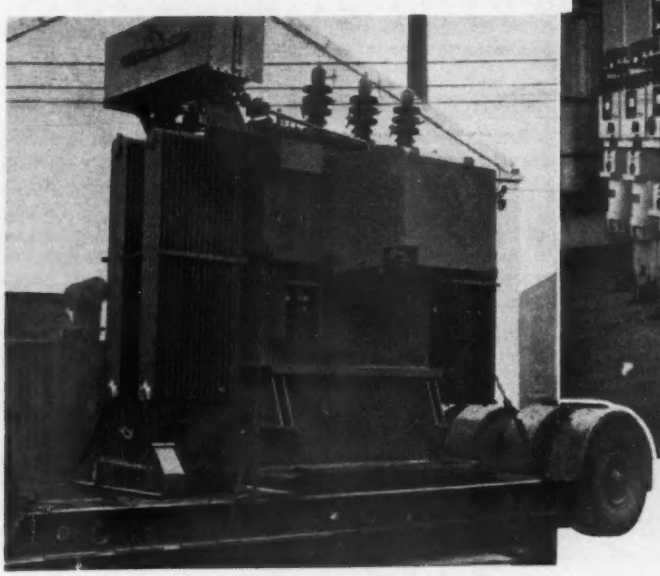
To meet the distribution requirements of the electricity boards, special types of transformers have been designed and constructed. These include units with air-insulated windings, liquid-cooled units with non-inflammable coolants and "buried" transformers up to 750 kVA.

In regard to deliveries during the year, home news includes the completion and commissioning of the switchboard at the BBC Television Centre, White City, and the outdoor 150 MVA, 6·25 kV single-phase switchgear specially developed and manufactured for the British Railways Eastern Region electrification scheme. A novel form of transportable substation on skids with a rating of 500 kVA was also developed and delivered to Richard Thomas and Baldwins steelworks near Newport.

Among new home contracts received is a CEGB £200,000 order for West Thurrock power station, while work in hand includes the 33 kV board for Hams Hall, 33 kV outdoor breakers for Northern Ireland, as well as equipment for the Admiralty and the GPO.

In the export field, the last of the switchgear on the £1,200,000 contract for the Compania Shell de Venezuela was completed and dispatched and will be in full service by mid-1961. Shipments of switchgear have also been made to Los Angeles on the $600,000 order received last year. New contracts received include a number of orders for equipment for the Middle East, among them being a large installation for Kuwait comprising a 15-panel and two 21-panel, 11 kV, 500 MVA, duplicate busbar, air-insulated switchboards. Oil refinery equipment is also on order for the Caltex plant at Istanbul and the Atas plant at Mersin, while Hong Kong continues to be a consistent customer.

From Rumania, an order for four large switchboards of the single-busbar, indoor metalclad, 300 MVA, 6 kV type and 24 motor control centres has been received for the Kraft Bag plant at Suceava, while further orders, both for switchgear and transformers, have been received from the Caribbean area, Nigeria and New Zealand. The apprentice training scheme, maintained by the company throughout its existence, has been improved by supporting sandwich courses for the H.N. Dep. Tech. awards.



Above is an 8-panel high voltage remote operated switchboard, one of several installed in the BBC Television Centre at White City. On the left is a 5 MVA, 33/11 kV transformer en route from the Treforest works to the SSEB site in Scotland

Car electrical systems

RECENT DEVELOPMENTS SURVEYED IN A.S.E.E. PAPER

IT must now be close on 30 years since coil ignition superseded the magneto on motor-cars, during which period the number of vehicles of all types on the road has increased enormously. Since a car with coil ignition is entirely dependent on the electrical system, the fact that car reliability has improved rather than declined is a tribute to the soundness of design and workmanship in all of the components which go to make up an electrical system. In fact, electrical reliability is rather taken for granted by the average car owner or driver, while designers continue to make ever-expanding calls on its capacity, even to the point of using it to operate automatic transmission systems on some of the higher-priced cars. In addition, the current fashion for more and larger headlamps, spotlights, flashing indicators, as well as many other devices not necessarily essential to the running of the car, represents a persistent drain of exceptionally variable load factor on the battery and generator.

While no great fundamental change has taken place in automobile electrics since the early days, there has been a constant stream of technical improvements, in batteries, generators and voltage regulators, which has enabled the system capacity to keep pace with demand. In an interesting paper* read before the ASEE in London last week, Mr W. Cooke gave a short survey of these developments, together with a preview of ideas now being studied which will be part of the car electrical system of tomorrow.

The Generating System

Basically, the system comprises a generator/voltage regulator combination and a storage battery feeding a simple distribution system. In this country, the voltage has been standardised at 12 and this is also being generally adopted in the USA. On the Continent, there are still a number of smaller cars with 6 V systems, but the larger cars are also coming into line with British and USA practice. The obvious advantages of the higher voltage is the lower current and voltage drop on heavy loads.

The generator is usually belt driven from the engine shaft and is, naturally, running at constantly varying speeds with the car. Voltage regulation is, therefore, essential and some form of voltage control has, in fact, been incorporated for at least 30 years. Prior to that time, a three-brush d.c. dynamo was in common use, acting on a constant-current principle, relying on the battery floating across it to maintain steady voltage. Early forms of regulator worked on the Tirrill vibrating contact principle and these have undergone considerable refinement to include compensation for copper winding temperatures, ambient temperatures and also to match the characteristics of the battery with temperature and charge variation. In larger cars a double unit current and voltage regulator has been used, both in the UK and USA, to deal with a discharged battery condition. When discharged, full generator output is applied to the battery via a constant-current type of regulator and, as the battery voltage rises, a changeover to the second unit is effected to bring it under constant-voltage regulation. There is also, of course, a cut-out to prevent feed-back from the battery to the generator when the engine is not running.

The design of the generator has been considerably simplified by the adoption of the two-brush scheme, but the increase in maximum engine speeds has introduced complications in that, for the battery to come on charge at engine speeds corresponding to 10-15 m.p.h., which are normal to driving in traffic, the armature windings must be strong enough to resist bursting under centrifugal forces at maximum engine speeds. This has led to the adoption of the "shuttle" principle of winding with a chord slot of less than a pole pitch which gives a more easily balanced armature, slight saving in copper and mechanically stronger construction. High speeds, however, introduce commutator problems, of which brush-bounce is the most serious. The modern design adopts a fixed brush-box with sliding brushes arranged either radially or with a slight trail. Recent studies of air-flow have done much to improve cooling.

Alternators and Rectifiers

A modern development of significant interest is the adoption of three-phase alternators with silicon diode rectifiers and permanent magnet rotors. Single-phase alternators with selenium rectifiers have, of course, been standard on motor-cycles for about ten years. Alternators require a voltage regulator after rectification but do not need a cut-out as the rectifier is a non-reversible current device. A survey suggests that the economic turning point from generator to alternator is 40 A output.

Batteries and Starters

Apart from the normal demands on a battery, the heaviest duty it is called on to perform is that of starting. Unaided by the generator, it will have to deliver 200 A to 400 A and yet sustain voltage sufficient to provide ignition. Modern thin plate techniques have done much to improve battery capacity and life, while newer synthetic separator materials have helped to reduce internal resistance and voltage drop.

The starter is also an important piece of equipment. It must supply sufficient energy to turn over the motor from cold, which may need anything from 1 h.p. to 2½ h.p. output. The relation between internal resistance of the starter and battery is a close one.

Coil ignition systems have changed little since the early days. For future high-speed engines, the problem of providing a sufficient number of sparks per second, each of the requisite energy, is a real one and transistor systems are now being developed to meet the conditions.

* "Motor Vehicle Electrical Equipment."

STANDARDISATION PROGRESS

BRITISH STANDARDS . . . INTERNATIONAL RECOMMENDATIONS . . . INDUSTRY CODES

TWO recent British Standards bring up-to-date provision for high-voltage insulators in the BS list. They are BS 137: 1960, *Porcelain and Toughened Glass Insulators for Overhead Power Lines (33 kV and upwards)*, and BS 3297: 1960, *High Voltage Post Insulators*. BS 137 is a revision of the 1941 edition; BS 3297 covers post insulators for other applications.

Close attention to the recommendations of the International Electrotechnical Commission is a feature of the revised BS 137, particularly as regards testing, but also in relation to the details of ball and socket couplings. As a result of the latter feature, complete interchangeability is claimed with practice in Europe and many other parts of the world.

One of the important changes in this standard is substitution of "failing loads" (mechanical) for the "working loads" previously laid down. The new values are numerically about three times the old. For toughened glass insulators, there is a thermal shock test involving immersion in water at least 100°C colder than the insulator, as well as the well-established temperature cycling test with a 70°C differential.

Tests called for in the standard are divided into three categories: type tests, establishing design characteristics (impulse withstand voltage and flashover, power frequency withstand and flashover, dry and wet, and visible discharge); sample tests, taken on insulators at random for every batch offered for acceptance and intended to verify quality of materials (check on dimensions, temperature cycle and thermal shock for toughened glass, mechanical or electro-mechanical failure, over-voltage, porosity for porcelain insulators, galvanising quality); routine tests, performed on every insulator to check manufacturing defects (electrical test for porcelain insulators, thermal shock on toughened glass, mechanical test on string insulators).

BS 3297 is concerned with porcelain and toughened glass post insulators, primarily for use out of doors at working voltages of 3·3 kV and above, designed for use in busbar runs or for supporting parts of air-break switches and the like. Once again, there are type, sample and routine tests specified.

Type tests are generally as in BS 137 so far as methods are concerned and the "sample" and "routine" tests have many features common with that standard.

An appendix to the standard gives advice on the selection of post insulators, and characteristics with BS reference numbers are given for the post insulator units most commonly used in Britain.

New BSI Projects

FIVE newly started BSI projects announced recently are important to the electrical industry. One is preparation of a standard for air-break switches and isolators, to be part 2 of BS 861, covering higher currents and heavier duties than are at present provided for. Another was the aim of setting out a test for determining the spontaneous ignition temperature of the surface of electrical equipment used in the presence of explosive gases. The other projects involve artificial daylight fittings for colour matching (a revision of BS 950), lighting sets for indoor Christmas trees from the safety aspect, and an industrial grade of sound-level meter.

ISO Report

AMONGST decisions taken at a recent meeting of the International Standards Organisation committee on refrigeration was one that all questions relating to the electrical equipment of refrigerators should be referred to the International Electrotechnical Commission. The ISO committee is currently dealing with a number of subjects, including the construction and testing of household refrigerators.

Hair Dryer Safety

REQUIREMENTS for construction and tests for compliance with requirements are consolidated in each clause of BS 3296: *Safety Requirements for Domestic Electric Hair Dyers*, a recent addition to the BSI range covering domestic electrical appliances. Included in the requirements are enclosure to avoid risk of contact with live parts, stability where a stand is provided, loading and leakage current limits and earthing details.

A general requirement is that dryers shall be constructed so that any electrical or mechanical failure impairing compliance with the standard is prevented. To this end, an operating test is included covering 75 on-off cycles each of 95 min total time.

Cords attached to dryers are required to be kink resisting and to be well anchored and guarded where they enter the dryer. There are a number of detailed constructional requirements affecting materials used and also the arrangement of wiring and terminals. In this respect, an overall check entitled "abnormal operation" requires the dryer to be placed on a flat wood surface and covered by white tissue paper. With two hours' operation, there must be no flame and the wood surface must not smoulder or ignite. This test is extended to 100 hours' operation if resetting cut-outs are fitted.

COAL BOARD STANDARDISATION

TWO electrical standards are included amongst specifications issued in recent weeks by the National Coal Board. They are 202/1960, *Wire-Armoured Paper-Insulated Cables for Power Supplies*; and 224/1960, *Adhesive Insulating Tape for Electrical Purposes*. The former standard in general requires compliance with BS 760, but adds requirements and selects preferred designs.

An overall demand is that conductance of the armour alone shall be not less than 50% of that of the largest copper conductor in the cable, even if this requires addition of copper wires to the specified galvanised steel armouring. Where fire-resisting finish is called for, a black p.v.c. compound is to be applied over the armouring in place of standard tape and braid serving. In this case, the armouring wires must be well coated with a water-resisting compound.

Besides BS 760 tests, the specification calls for bending and drainage tests to be applied on a batch-sampling basis. In addition, where p.v.c. sheathing is used, a fire-resistance test is required with a 12 in. limit on total length of cable burnt or charred when the BS 760 test is applied.

Adhesive tape to specification 224/1960 has to comply with BS 1078, but a detailed description of the make-up of the tape is written into the NCB specification, and standard thickness and width and roll lengths are laid down, together with required packaging details.

Two other recent NCB specifications cover *Milling Cutters* (222/1960) and *High Tension Steel Chain for Longwall Trepanners* (214/1960).

Specifying Rubber

GUIDANCE for purchasers of engineering rubber products who wish to prepare purchasing specifications is given in a short *Guide to the Drafting of Specification of Rubber Products*, available free from the Federation of British Rubber and Allied Manufacturers at 43 Bedford Sq, WC1. It gives guides on tests for checking performance (by the user) and on quality control tests (by the manufacturer) and on what dimensional tolerances are appropriate.

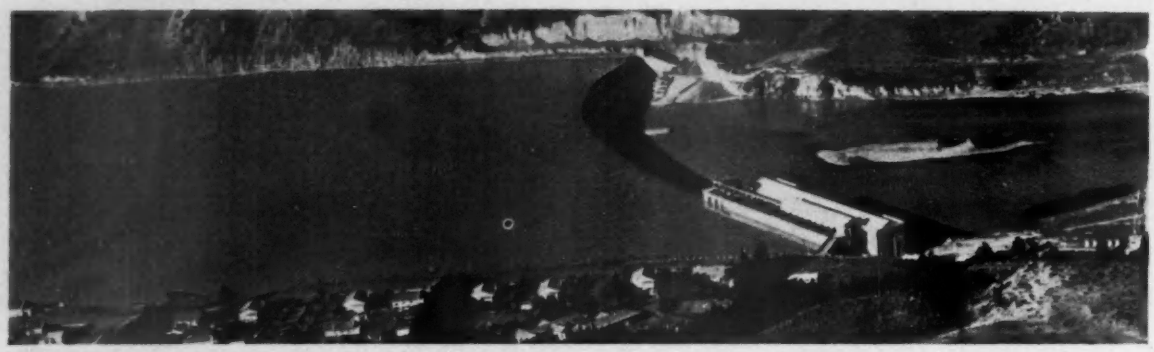


Fig. 1. The 105 MW Waitaki Station on South Island, dating from 1935

New Zealand's generation plans

TACKLING THE NORTH—SOUTH ISLANDS UNBALANCE

POWER stations in New Zealand, some of which are shown in the accompanying illustrations, have to feed a power system whose major demand comes from homes. Some 60% of consumption is used by domestic consumers, a reflection of the low cost of electricity based on the country's extensive water resources.

The New Zealand Electricity Department owns about 90% of the country's generating capacity, and also controls bulk transmission. In the two main islands, there is a 220 kV system totalling some 1,100 miles, with another 4,233 miles of 33 and 11 kV lines. Building up the supply system is reckoned to have cost about £252 million, say £109 for every member of the New Zealand population. Generation in terms of population is currently about 2,712 kWh/head, which places New Zealand amongst the first six in the world, and this without the inflating effect of any large electro-chemical industry, although there are plans to introduce a hydro-based aluminium industry. Generating capacity at present is 1,400 MW.

Cost of generation in New Zealand is 0·427d/kWh, varying between 0·34d for hydro stations and 1·48d for thermal. Average retail price, so far as this has any meaning, is 1·424d/kWh.

One of the key factors about NZ power supply planning is that, while the North Island has two-thirds of the country's population, it has less than half the estimated hydro generating potential. The exciting possibility of a 500 kV d.c. submarine cable link between North and South Islands has its origin in this unbalance, and so does the attention given in the North Island to development of such unconventional power sources as geothermal steam.

Capacity of state-owned power stations in North Island at March, 1960, was 1,032 MW, including 180 MW from the coal-burning Meremere station and 69 MW from geothermal energy at Wairakei. Most of the hydro output comes from two complexes; five stations on the Waikato River, and three stations fed from Lake Waikaremoana.

The Waikato River is the longest in New Zealand, at 220 miles, and drains Lake Taupo, prominent in maps in the centre of the North Island. Lake Taupo, which lies at 1,210 ft altitude, has an area of 238 sq miles, a depth of 534 ft, and drains a catchment area of 1,250 sq miles. On a 90-mile stretch of river there are nine stations operating, or in course of construction: Karapiro (90 MW), Arapuni (158 MW), Waipapa (51 MW, 1961-scheduled), Maraetai (180 MW, and being duplicated), Whakamaru (100 MW), Atiamuri (84 MW), Ohakuri (112 MW, 1961-scheduled) and Aratiatia (90 MW, 1964-scheduled). Building these stations has raised many civil engineering problems, for they lie in what was once earthquake country, and severely faulted strata have had to be dealt with.

The 180 MW station at Meremere, already mentioned, was built as an emergency measure at a time when electricity consumption was increasing more rapidly than hydro construction could extend generating capacity. It is fired with coal brought by aerial ropeway from nearby open-cast mines.

Geothermal generation at Wairakei, near the northern shore of Lake Taupo, began in November, 1958, following several years spent in proving the existence of large quantities of subterranean steam. A seven-generator first stage of 60 MW is now operating. Revocation of a plan

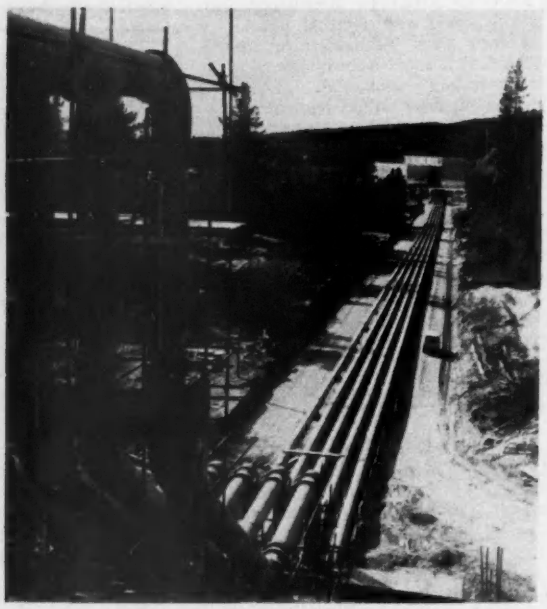


Fig. 2. Power house for stage 1 of the Wairakei geothermal scheme. The 21 in. diameter pipes carry steam one mile from the bores to the power house. In the foreground is one of the 200 ft. by 75 ft. loops which take up thermal expansion

to use the geothermal power for production of heavy water for nuclear purposes has changed the rest of the scheme, which currently provides for 83 MW in a second stage, and a third stage adding about another 100 MW, so that ultimate capacity of the scheme becomes, in round figures, 250 MW.

The other hydro complex in the North Island is based on Lake Waikaremoana, and the three stations involved have a combined capacity of 124 MW.

Long-term plans for North Island power are not clear. By 1965, there should be one station operating in the Bay of Plenty area, at Matahina, on the Rangitaiki River; and the hydro potential of the Wanganui, the second longest river in the country, is under investigation with a report promised later this year. However, the most striking possibility for the future again involves Lake Taupo.

By 1965, the existing hydro possibilities of the Waikato, flowing from Lake Taupo, will have been realised. The current suggestion is that rivers rising on the other side of the mountain ranges should be diverted into Lake Taupo, with power generation en route. Such a scheme is, of course, reminiscent of the Snowy Mountains project in Australia. If such a plan is adopted, impressive civil engineering construction, including nine-mile long tunnels, will be involved.

In the South Island, geological conditions are more favourable to dam building than in the North, and hydro potential is widely distributed. Particularly notable are the stations on the Waitaki River, in the western central part of the island. Included amongst these is Benmore, which, with an installed capacity of 540 MW, will represent the largest station so far attempted in New Zealand. It is scheduled to begin generation in 1965, and will have as its most striking feature an earth dam which will be one of the largest in the Southern Hemisphere.

Fig. 3. Interior of Roxburgh power station currently New Zealand's largest at 160 MW and being extended by four 40 MW machines

Largest station in New Zealand at present is in the South Island at Roxburgh, on the Clutha River; its existing 160 MW capacity is being doubled. It is in the far south of the South Island, in "Fiordland," that the possibility of aluminium production is being investigated, with potential power requirements exceeding those of the South Island at present, according to an official report.

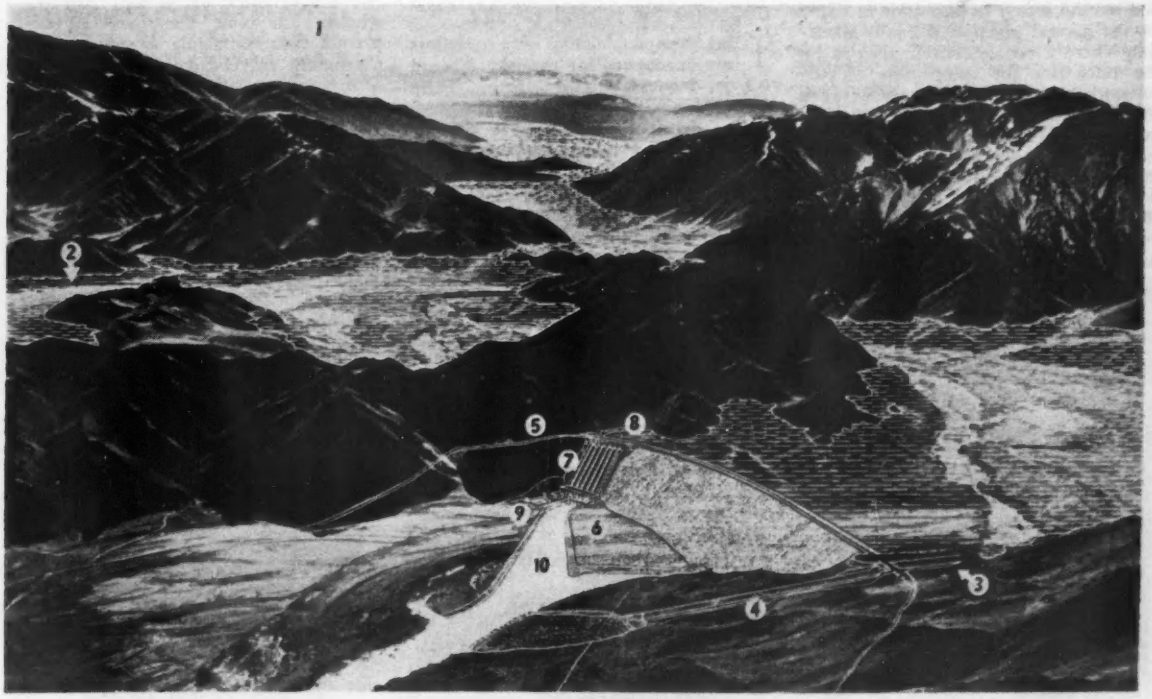


Fig. 4. The 540 MW Benmore scheme as it will appear when completed, superimposed on an aerial photograph of the site

1, Mount Cook (12,349 ft, New Zealand's highest). 2, the Ahuriri River, a tributary of the Waitaki. 3, spillway intake. 4, spillway chute. 5 is a proposed roadway to the dam crest and an observation point. 6 and 9 are outdoor substations for a.c. and d.c. transmission. 7 is the site of the penstocks. 8 the intake dam. 10, the tailrace.

new products and appliances

Glass-fibre banding tape

A NEW method of banding or strapping together transformer and electrical machine laminations employs high-tensile glass yarns laid parallel to form a tape and bonded with thermo-setting resin. Known as "Res-i-Glas" tape, it is wrapped round the laminated component in an uncured state at a nominal tension of about 600lb/in. width. When cured, it clings together cohesively in a homogenous mass said to develop the quite remarkable tensile strength of 220,000 lb/sq in. ultimate. Special advantages claimed for its use in contrast to steel bands are that no insulation is necessary and preparation of parallel surfaces is not required. Superior arc resistance is also claimed. *P. P. Payne and Sons Ltd., Haydn Rd, Nottingham.*

"Bonus Clock"

DEVISED for the simplification of factory time-keeping and the estimation of piecework bonus earned by operatives, a recently introduced timing indicator, known as the "Bonus Clock," should also provide a useful tool for time and motion study. Its operation is based on the normal practice of bonus allocation where a certain time is allowed by the rate fixer for completion of jobs or work cycles. The difference between this allotted time and the actual time taken by the operative, whether positive or negative, is known as "bonus time" and determines the amount of monetary bonus earned or forfeited. Thus, the device incorporates a dial for setting up cycle time allowed for a particular job or operation and a central dial upon which a pointer registers accumulated bonus time for a series of work cycles over a period, say, one working day. The number of cycles or operations is recorded on a digital counter, while two warning lights, respectively green and red, indicate to the operative during any particular cycle, whether bonus time is being gained or lost. The device runs off mains electricity supply and the timing of each cycle is set in motion by the operative himself by depressing a switch button, although this can be done automatically if required. Bonus time indicator and cycle counter can be reset at the end of the work period, these being accessible by unlocking the front glass panel. Advantages claimed for the "Bonus Clock" are that it provides a fair means of assessing bonus due and cuts down the amount of clerical work normally required. In addition, it is said to increase individual productive capacity while at the same time giving an accurate check of actual rate of production. *D. Robinson and Co. Ltd., Gunnersbury Hse, 717 London Rd, Hounslow, Middx.*

Whether bonus is being earned or lost is immediately obvious to a machine operator equipped with this Robinson bonus clock

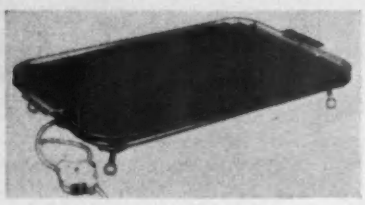
Capacitor for printed circuits

TWO types of miniature mica capacitors are announced for use with 0·1 and 0·2 in. module printed circuits. These form an addition to the "Silver Star" range of capacitors for high stability working with good insulation resistance and low power factor. Type A15E, having dimensions ¼ in. sq by ¼ in. long, can be supplied in the capacitance range 33 to 6,000 $\mu\mu$F, ±2%. Type A25E, which has the same section but is 1 in. long, covers the range 6,000 to 20,000 $\mu\mu$F, ±1%. Both types are rated at 50 V peak and are encapsulated in synthetic resin. *Johnson, Matthey and Co. Ltd., 78-83 Hatton Gdn, E.C.1.*

Hot tray for the table

THE rapidly growing ranks of on-the-table plate-warming appliances see another introduction this month—a heated tray of 200 W loading. It is an ordinary anodised tray with finger-grips at each end, but is provided with four small feet to avoid damage to table surfaces. A switch and pilot light are incorporated in the flex.

Two sizes of tray are available: 18 in. by 12 in. and 22 in. by 14 in., selling at £6 12s 6d and £7 17s 6d tax paid, respectively. *Carefree Domestic Appliances, 44-48 Adeline St, Red Bank, Manchester.*



A heated tray by Carefree. It has 200 W loading and sells at £7 17s 6d large size

Washing machine prices up

INCREASES in prices of washing machines are announced by certain manufacturers. Hotpoint's rise will become effective on 30 Jan., making top models in the "Countess," "Empress" and "Princess" ranges dearer by £4 4s. "Supermatic" new price will be £93 9s tax paid.

Two Parnall washers were increased in price on 1 Jan.—EW60 (unheated) and EW60H (heated), which now sell at £84 and £88 4s, respectively.

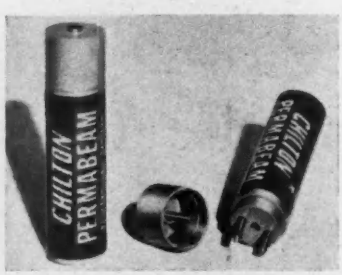
Price changes by Burco will be effective from 1 Feb. Model Twenty-One, a combined washing-machine dryer will be increased by £4 4s to sell at £87 3s. Boiler Model 765 will be priced £7 14s, Model E300 AS £12 19s 6d and Model 375 AS £10 6s 6d—increases of a few shillings only.

AEI-Hotpoint, 33 Grosvenor Pl, S.W.1.
Electrical Division of Radiation, 143 Sloane St, S.W.1.
Burco-Dean Ltd., Rose Grove, Burnley.

Rechargeable battery

A NEW rechargeable battery fits any instrument normally powered by two U2 batteries, yet is only half the weight. The unit comprises a blue plastics case containing a series of rechargeable nickel-cadmium button-type cells equipped with normal battery contacts and a recharging circuit. A two-pin plug is incorporated, concealed by a simply removable cap. For recharging, the battery is plugged into a two-pin a.c. 240 V socket-outlet and left overnight or for any convenient period.

The standard model is 2·5 V and sells at £1 9s 6d. Other models available have 3·5 V, 5 V and 6 V rating, all with no variation in size. Dimensions of the new battery, "Permabeam," are: 4¼ in. long by 1¼ in. in diameter. *Chilton Electric Products, 19 Old Queen St, S.W.1.*



The new Chilton rechargeable battery. Price £1 9s 6d

Imported p.t.f.e.

THE import of Italian-manufactured polytetrafluorethylene, "Algoflon," in the form of semi-manufactured products, is announced by Joseph Weil and Son Ltd., sole agents. "Algoflon" is said to compare in quality with existing world standards and products include rods, tapes, sleeves and tubes. Special thin-walled grades of tube are available suitable for electrical insulation. *Joseph Weil and Son Ltd., Friars Hse, 39-41 New Broad St, E.C.2.*

Drying-out equipment insulation

ONE of the problems encountered in the maintenance of electrical equipment is insulation rendered faulty by the ingress of moisture. This happens frequently on board ship and to meet such an emergency portable drying-out equipment is available, designed specifically for marine use. Known as EAF equipment, it is of Norwegian manufacture and is now marketed in this country by AEI. The equipment consists essentially of a low-voltage source of supply for passing a heating current through the faulty circuit, thus drying out captive moisture. There are eight nominal voltages available, ranging from 2 V to 60 V a.c., with five pairs of output terminals catering for cable sizes from 3/·036 to 7/·052 with an additional pair of terminals for heavier cables. Built in to the equipment are an ammeter and voltmeter for measuring heating current and voltage and a megohmmeter, by means of which insulation resistance can be continuously monitored. A thermostat is incorporated to prevent overheating of conductors and insulation, conductor temperature being registered by a resistance thermometer. To dry-out a faulty cable the cores at the far end are shorted together, those at the near end being connected to the appropriate pair of output terminals on the equipment. The correct drying current for a particular cable size is selected from a printed table supplied with the equipment, conveniently displayed with other cable-drying data, on the instrument panel. As the temperature of the cable rises, any moisture present in the insulation migrates towards the ends, raising the concentration. However, since the supply voltage is low, no flashover takes place and when the temperature exceeds the ambient level, the moisture is said to evaporate rapidly. Electrical machines can be dried out in a similar manner, although for this application, heating is achieved mainly by iron losses. The equipment measures approximately 15¾ in. by 15¾ in. by 21½ in. and is suitable for a voltage input of 220 V at 50 c/s to 60 c/s. A converter unit is available for ships having d.c. supply systems. *AEI Ltd., Telecommunications Division, Woolwich, S.E.18.*

This EAF transportable equipment for testing and drying out electrical gear subjected to moisture is now being marketed by AEI Telecommunications Division

Electro-magnetic clutches

ELECTRO-MAGNETIC clutches by Heid, of Vienna, are available in this country. The clutches are of the spring-loaded types, engaging when the current supply is switched off and the design is such that no slip-rings are necessary. The range comprises two variations, both covering transmission torques ranging from 8·6 lb ft to 4,560 lb ft. The first, known as the "F.O." type, can be run immersed in oil and has a self-compensating air-gap. The second, the "F.M.," suitable for both oil-immersed and dry running, has an adjustable air-gap for torque adjustment. The electro-magnets are normally suitable for 24 V d.c., but can be supplied for other voltages and for rapid excitation, if required. *Ringway Machine Tools, 42 Barton Arcade, Deansgate, Manchester 3.*

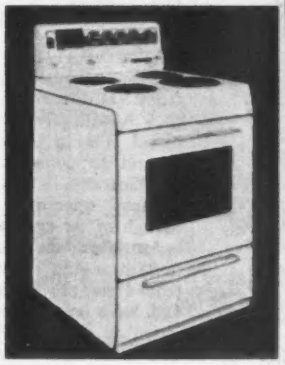
LUXURY COOKERS FROM CANADA

COOKERS from the Canadian manufacturers, Moffats, at present available in this country as imports, are soon to be assembled here. The recent opening of a new spares depot and showrooms in the West End of London marks the beginning of a new sales drive and two new cookers below the £100 level are to be introduced at the Ideal Home exhibition.

Ranging up to £205, all models show the attention to detail which usually characterises transatlantic cooking appliances. All but the cheapest model have double glass windows in the oven doors, large warming drawers with separate heating, pilot lights for every hotplate, a wide range of temperature control and automatic timing. An interesting feature of the larger models is a variation of the simmer control principle whereby a thermostat is incorporated in a spring-mounted box in the centre of the hotplate. This presses against the base of cooking pans and allows a close temperature control. Another novel feature of the top models is the "meat minder" —a probe which is inserted into the joint and operates a buzzer when the meat is done to order. In addition to this, oven shelves can be raised and lowered from outside by a simple knob. The separate eye-level grill as we know it seems to be absent from most American-style cookers. In the case of Moffat's range, grills are incorporated within the ovens and can accommodate up to nine steaks at a time and all but the cheapest models have rotisseries. These features, plus recessed hotplates for frying and fluorescent lighting on the control panels, put the cookers indisputably in the luxury class.

The two new lower-priced units are 24E27, at £85, and 24E37W, at £99 10s. They are both 24 in. wide and are identical in construction to the top-priced models with four widely spaced hotplates, really large ovens and controls mounted on raised panels at the rear of the hobs. The difference between the two is that the £85 model (not illustrated) has no window in the oven and does not incorporate a rotisserie. Doors open downward and have an "ajar" position for cooling off. Easily removable drip bowls, chrome rings and neat individual crumb trays under the hotplates make for simple cleaning. Finish in both cases is white porcelain enamel. Model 30E100W, illustrated below, is typical of the models in the upper part of the range. It incorporates all of the luxury features mentioned and sells at £152. over a price range from £117 to £205.

Built-in ovens incorporating the features of the free-standing models are also available at prices from £66 to £99, and counter units from £24 to £45. *Moffats, 35 Davies St, W.1.*



Two typical Moffat cookers. Above: 30E100W at £152 which has all the features mentioned. Left: One of the new models, 24E37W, at £99 10s

P.T.F.E. product price cut

A PRICE reduction is announced for moulded products in "Fluorosint," a filled p.t.f.e. base resin for electrical and chemical usage. The reduction has been the result of increased demand and the introduction of improved production methods. *Polypenco Ltd., 68-70 Tewin Rd, Welwyn Garden City.*

Atlas light fittings prices

EXTENSIVE price changes are announced by Atlas for some ranges of tungsten lighting fittings. Ranges affected are Wellglass, bulkhead and floodlighting fittings, prices of which are modified by a few shillings up or down. New prices come into operation on 23 Jan. *Atlas Lighting, Thorn Hse, Upper St. Martin's La, W.C.2.*

Hotpoint small appliance prices

INCREASES of 5% in prices of small appliances are announced by Hotpoint. A selection of prices is as follows: cleaner with attachments, £26 5s; 2 kW convector heater (thermostat control), £10 5s; "Superglo" 1 kW fire, £3 7s 6d; "Jewel" 1 kW fire, £2 12s 6d; "Hi-Speed" kettle, £5. *AEI-Hotpoint Ltd., 33 Grosvenor Pl, S.W.1.*

RELAYS AND CONTACTORS

WITH the increased adoption of automatic control in industry, relays, contactors and similar electro-mechanical devices assume an even more vital role. Present demands are for improved reliability, ease of maintenance and compact construction. Manufacturers have concentrated on such aspects as reduction of contact wear and erosion, moisture-proofing of coil windings and increased adoption of unit construction. Attention has also been paid to the reduction of noise.

Intended for incorporation into counting, sequencing and similar automatic equipment, Thorn Electrical Industries supply a relay stepping switch which combines three separate switching functions. A common shaft incorporating a ratchet and pawl mechanism, and actuated by a relay coil, steps-round four wiper arms, insulated separately. These connect in individual sequence, four banks of 12 contacts arranged in a circle, each bank occupying a quadrant. The sliding wiper contacts are of phosphor bronze and each is capable of carrying a steady current of 0·5 A and of stepping-off a load of 0·1 A at 50 V, non-inductive. The shaft carries in addition, two circular cams, each of which actuates up to five pairs of contacts in a sequence determined by the cam eccentricity. Finally, the rotary stepping action opens and closes a further two sets of four contacts. Subsidiary contacts each have the same ratings as the rotary switch contacts. The maximum stepping speed is 40 steps/sec with a power consumption of 4 W. The life expectancy of this device is claimed to be 5 to 6 million operations and, amongst its other applications are remote control and telemetering.

A development by B and R Relays is a vacuum switch, which can be used in conjunction with a specially designed relay. The device is claimed to be capable of switching loads of 2 kW at voltages up to 3,000 V. The switch contacts are compactly housed under vacuum in a glass and metal envelope. This affords protection from all types of contamination and thus ensures minimum contact resistance. Amongst its wide range of applications are switching of fluorescent tubes, medical apparatus and h.t. supplies for radio installations. A plastics housing is available and up to four units can be mounted on types C. 12 or C. 62 relays, designed for the purpose. These relays have nominal coil powers of 6 W or 20 VA, one being for d.c. operation, the other for a.c.

A new industrial control relay by Square D, designated the Class 7001, is suitable for switching a.c. or d.c. supplies and for operation at up to 250 V d.c. A range of coils is available for voltages below the maximum, these being encapsulated in epoxy resin to give protection against mechanical damage and the ingress of moisture. There are three basic types providing, respectively, four, six and ten pairs of silver, double-break contacts. A mechanical latching attachment can be supplied if required, the relay being normally electrically held.

Another relay on the market, of the plug-in variety, is available with six different contact ratings. These range from 300 mA, employing silver to silver, to 8 A with silver to cadmium oxide or nickel. This is made by Keyswitch and is said to comply with relevant GPO specifications.

Silent operation of contactors, although of no great significance for most industrial applications, can be an important selling point for contactors intended for the domestic market. Santon Ltd. have recently introduced a contactor intended specifically for control of domestic floor-warming systems, for which it is claimed armature coil hum has been reduced to a negligible amount. This has been achieved principally by increasing residual magnetism in the laminated core, with some sacrifice to speed of operation. Types available are 30 A, double- and triple-pole, 50 A single-pole, all rated at 550 V a.c. Contacts are solid silver, complying with BSS 775 for non-inductive loads.

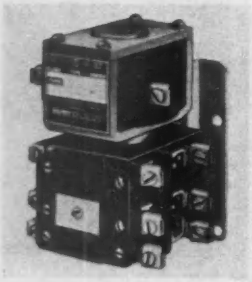
Santon Ltd., Somerton Works, Newport, Monmouthshire.

Thorn Electrical Industries Ltd., Thorn Hse, Upper St. Martin's La, W.C.2.

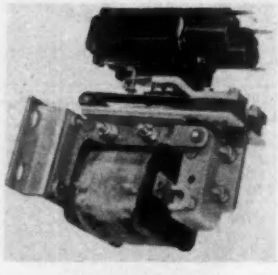
B and R Relays Ltd., Temple Fields, Harlow, Essex.

Square D Ltd., Cheney Manor, Swindon, Wilts.

The Keyswitch Co., 2 Irongate Wharf Rd, Praed St, W.2.



Up to 10 contacts for 10 A rating can be supplied on the three types of this Class 7001-type D relay introduced by Square D. The relay is intended for d.c. supplies



This B and R relay will operate four vacuum switches each with a rating of up to 2 kW

TRADE PUBLICATIONS

GRELCO.—Wall-chart showing the range of outlet adaptors from 2 A two-pin double socket adaptor to the largest 13 A and 5 A three-pin triple outlet. Grelco Ltd., Minehead, Somerset.

STURTEVANT.—Publication 6904; illustrated pamphlet: "High Efficiency Cyclone Dust Collector."—Publication 4104; 24-page illustrated booklet: "Heating and Ventilating." Sturtevant Engineering Co., Southern Hse, Cannon St, E.C.4.

MICROSCAN.—32-page brochure List 177/2. Technical information and illustrations demonstrating applications of the Microscan X-ray analyser—a scanning electron-probe X-ray microanalyser with built-in optical microscope. Cambridge Instrument Co., 13 Grosvenor Pl, S.W.1.

ENGELHARD.—14-page illustrated booklet entitled "Some Industrial uses of Platinum Metals." Engelhard Industries Ltd., Baker Platinum Division, 52 High Holborn, W.C.1.

WESTINGHOUSE.—Six brochures on mining equipment: CP7, "Control of Mine Vehicles in Cages." CP8, "Auxiliary Valves." CP26, "Combined Stop and Restarter." CP27 (2nd Ed.), "Mine Traffic Control for Locomotive Haulage Roads." CP29, "Propelling Unit." CP1010, "Traffic Control at the Hawthorn Combined Mine." Westinghouse Brake and Signal Co., 82 York Way, King's Cross, N.1.

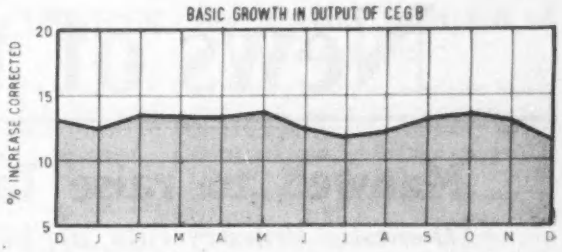
ROCOL.—Six-page publication: "Applications of Rocol Molybdenised Products in Power Stations." Divided into three sections: Turbines, Boilers and Associated Equipment, and Coal Handling and Preparation. Rocol Ltd., General Bldgs, Aldwych, W.C.2.

M.S.—News Bulletin No. 7: "Midland Silicone News." Midland Silicones Ltd., 68 Knightsbridge, S.W.1.

E.A.C.—Illustration Sheet No. 142 entitled "EAC in the Royal Navy," describing automatic equipment installed in H.M. ships. The Electric Apparatus Co., St. Albans, Herts.

POWER SUPPLY

Statistics for December



ALTHOUGH once again December was a favourite month for new plant commissioning by the CEGB, two facts make it of special interest. The 440 MW of plant commissioned was the highest since December, 1958, and this total represents the output of only three sets. Largest of the sets commissioned was the third English Electric 200 MW turbo-generator at High Marnham (East Midlands). This set has an associated 1,400 klb/hr boiler built by Foster Wheeler. Foster Wheeler also supplied the 860 klb/hr boiler for the No. 8, 120 MW Parsons set at Drakelow "B" (East Midlands).

The third turbo-alternator commissioned during the month, also rated 120 MW, was the No. 3 set at Northfleet (London). Built by GEC, this turbine is supplied with steam by an International Combustion 860 klb/hr boiler.

No new plant was brought into service by the SSEB, but the NSHEB commissioned a 0·5 MW water turbine plant at Chliostair. This set was built by English Electric.

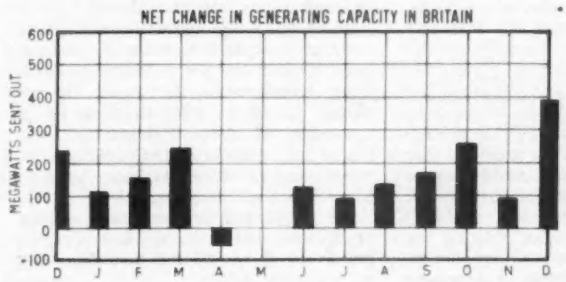
Coal consumption in December for the three boards was 15·6% up on December, 1959, at 5·5 million tons. Although over 20% of the SSEB electricity to meet district requirements is imported either from the CEGB, the NSHEB or the UKAEA, reports say coal imports from England are running at 20,000 tons per week. This is said to be increasing SSEB generating costs by as much as 25%, although these are to some extent defrayed by charges for peak power exports to the CEGB.

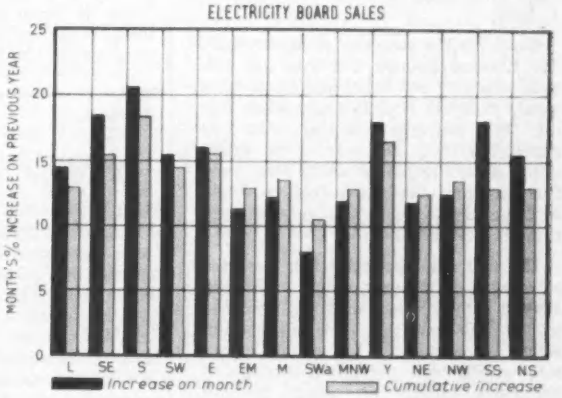
At the end of the month the total generating output capacity of the three boards was 29,575 MW, or 6·4% higher than in December, 1959. The total number of units generated rose over the year by 13·3% to 12,659 million units in December. Of this total, 11,601 million units were generated by the CEGB, 283 million units by the NSHEB and 775 million units by the SSEB. The total electricity sent out by the three boards during the month was 11,938 million units. The figures for the Area Board sales show that the largest sales increases during the month, varying from 14% to over 20%, occurred in the mainly non-industrial southern areas, although once again the Yorkshire Board's sales rose by more than 18%. The total increase in sales during the month was 13·9%, but this reduces to 11·5% when the usual corrections have been made for number of working days and weather conditions.

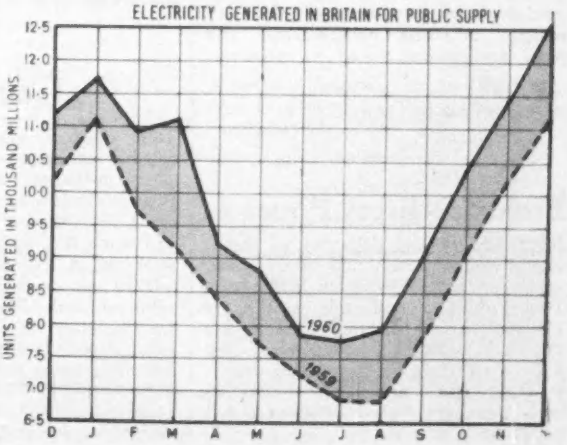
Electricity Board Sales Progress in December

Board	Electricity sent out in millions of units	% Increase December 1959
London	1,051·7	14·3
South Eastern	732·6	18·4
Southern	969·4	20·5
South Western	424·7	15·3
Eastern	1,123·7	15·9
East Midlands	860·1	11·2
Midlands	1,155·4	12·1
South Wales	553·5	7·9
Merseyside and N. Wales	661·7	11·9
Yorkshire	1,144·2	18·1
North Eastern	625·1	11·7
North Western...	1,128·2	12·4
Direct Supplies by CEGB	334·1	1·8
CEGB Total	10,764·4	13·9
South of Scotland	941·2	18·0
North of Scotland	210·7	15·4

Table excludes area board purchases from other sources.







News of the Week

Manweb to raise Tariffs

Domestic Primary rate up ½d to 6d

FIRST of the Boards to announce increased charges arising from the new bulk supply tariff and other higher costs is the Merseyside and North Wales Electricity Board. Mr D. H. Kendon, chairman of the Board, told the area Electricity Consultative Council last week that under the domestic tariff the primary rate is to go up from 5½d to 6d, and the secondary rate from 1·05d/unit to 1·15d/unit, but the follow-on rate of 0·95d would remain unchanged. For domestic consumers taking 1,000 units a quarter, the increase would amount to 8½d a week.

Commercial and industrial block tariffs and those for farms and combined premises would have their primary unit prices raised by ½d and all other rates increased by 0·01d. The m.d. tariffs would have the kW charges increased by 5s and the unit rate by 0·01d.

But in order to encourage off-peak development the unit rate of the off-peak tariff is to remain at 0·9d.

These new tariffs are intended to apply from 1 March, apart from the m.d. tariff which would operate from 1 April.

Outlining the reasons for the changes, Mr Kendon pointed out that the new bulk charges and other increased costs would raise the Board's expenditure during the coming financial year by £1,890,000, and the surplus of rather more than £1,400,000 which had been forecast from the year's trading would be changed into a deficit unless additional revenue was obtained.

The increases proposed were designed to produce in the year ending 31 March, 1962, a surplus which would be absorbed in the purchase of some £7 million worth of equipment for mains expansion. Along with the recent increase in borrowing powers on capital account granted to the industry, Manweb would need a surplus on revenue of about £1¼ million, otherwise reinforcement and rural development would be retarded.

Members of the Consultative Council, while realising that the increased charges were unavoidable, urged that in view of last year's surplus it was important that consumers should be told of the need for the increased tariffs.

Broken Delivery Promises

REPORTS of late deliveries of export orders had increased, and were causing serious concern, Sir William McFadzean, FBI president, said this week. He appealed to all heads of firms to see that their company's performance, even if only indirectly connected with export, is above reproach. If delay is unavoidable, the client should be given a full explanation, he said.

SHAVE OR SINGE?

AN electric shaver which burns off the whiskers has been patented in the US, according to reports. It has metal teeth 0·003 in. to 0·005 in. apart, every alternate one of which is fed at 600 V to 800 V a.c., the others being earthed through a transformer, it is stated. In use, arcs jump across the teeth, burning the beard off when the shaver is passed across the face. There is insulation to prevent live metal being touched and the shaver does not get hot, it is claimed!

Philips' expansion

PHILIPS Electrical Industries Ltd. have taken a long-term lease of five floors of a new 11-storey office building 50 yards from the firm's London headquarters at Century Hse. The new building—Berkshire Hse—stands at the junction of High Holborn and Endell St, facing the Princes Theatre, and has been built under a development scheme carried out jointly by the Holborn Borough Council and the Hammerson group of companies.

Another slurry station for Scotland

A NEW 60 MW slurry-burning power station, in addition to that at Barony, Ayrshire, is to be built in Fife by the South of Scotland Electricity Board. Mr William Hutton, deputy chairman of the Board, stated last Thursday that the economic success of Barony, which was opened in 1957, had encouraged them to proceed with a similar scheme in Fife. The possible sites had been narrowed down to four, but a final decision on the actual location is not expected for several months. There will be two 30 MW sets. The station, which will consume some 250,000 tons of slurry annually, is expected to be commissioned in 1965; although a slurry-burning station costs more to build than a normal coal-fired station, its fuel is comparatively cheap. The existing Barony station was put into commission at the end of 1956, the second 30 MW machine going on load in June, 1957.

The largest meter?

A 17 ft sq moving coil meter—probably the world's largest—will overlook the tenth Electrical Engineers' Exhibition at Earls Court when it opens on 21 March. With a scale over 20 ft long, the meter will record the total electrical load connected during the exhibition.

Weight of the instrument movement will be over 3 cwt, of which about one-tenth will be magnet. This will drive a 5 ft long aluminium pointer across a scale calibrated 0 to 5 MW. To be mounted on the first floor by the Warwick Rd entrance, the movement and dial have been designed and constructed by Nalder Bros. and Thompson Ltd., and a special current transformer will couple it to the main intake to Earls Court from the LEB supply.

Consumer Protection Bill

THE sale or offer of faulty goods capable of being dangerous to public safety or health would make a retailer or manufacturer liable to a £100 penalty for a first offence under the Consumer Protection Bill, which was published last week-end. A second offence would incur a £250 fine or three months' imprisonment or both. The Bill provides that the Secretary of State could impose requirements "as to the composition or contents, design, construction, finish or packing of, or otherwise relating to, goods of that class or any component thereof, as are in his opinion expedient to prevent or reduce risk of death or personal injury." He would also be empowered to require that any goods should carry a prescribed warning or instructions. Unless the goods complied with those requirements, it would be an offence to sell or offer them or be in possession of them. Sub-section 3 of Clause 3 also includes officials of nationalised industries as being open to any action under the regulations.

The Bill is due for its second reading on 27 Jan., and being the first order of the day it is anticipated that there will be a lengthy debate.

SOBER WELCOME FOR HP CONCESSION

SOBER welcome, tinged in some cases with disappointment, was the general reaction of the electrical appliance industry to last week's slight easing of the credit squeeze. Extension of the maximum repayment period from two to three years under hire-purchase agreements may help the car industry, but in the absence of any reduction of the minimum 20% deposit, appliance retailers felt it would have little direct effect on their turnover. The influence on minor appliances will be small indeed because the main finance houses are sticking to an old arrangement to limit the term to two years on goods valued at less than £30. Retailers generally felt that the main benefit would come from the improvement in buyer sentiment, particularly in view of the fact that the Chancellor hinted strongly that there would be no further relaxations for some time to come.

Main disappointment came from the manufacturing side. A BEAMA statement, while welcoming the concession as a step in the right direction, deplored the absence of any indication of long-term policy. "Manufacturers are still in the position where they are unable to do any planning on long production runs and this, obviously, must seriously weaken their position in the export market," the statement said. Mr J. Stanley, a director of Pye, said the new regulations were far too late to help.

Simultaneously, the Government introduced regulations to prevent evasion of HP restrictions by over-generous rental terms. "Free trial" periods are now limited to under 14 days, and rental payments may no longer tail off to less than 25% of the highest payments during the course of an agreement.

Colston Anniversary

SALES of the Colston dishwasher have exceeded those of all other British makes combined, Sir Charles Colston claimed at a gathering last week to celebrate the dishwasher's first year on the market. Labour force engaged on the project was now 500 strong, and production would soon be on a profit-making basis, he added.

The dishwasher had been well received abroad, holding its own, apparently, against competition from American and continental makes. Sir Charles said that exporting was being carried out on a substantial scale to Germany, Italy, Belgium, Holland and Ireland, and negotiations were well advanced in other continental and Commonwealth countries. Though exporting began only four months ago, he expects business by the end of this year to have reached nearly £¾ million in value.

E.E. BUILD TURBINES FOR NUCLEAR SUBMARINE

THE first propulsion steam turbines and condensers for a nuclear submarine to be made in this country are to be designed and built at English Electric's Rugby works. They are for Britain's second nuclear submarine, recently ordered from Vickers-Armstrongs. Rolls-Royce are handling the nuclear reactor side. Construction of a land-based prototype of the submarine's reactor is already under way at Dounreay, close to the fast breeder reactor. The reactor will use enriched uranium and be moderated and cooled by pressurised water. It should be critical in 1962.

Reactor and turbines for Britain's first nuclear submarine, the *Dreadnought*, were supplied by Westinghouse, of America.

NO INQUIRY ON GLEN NEVIS?

THE number of objectors to the Glen Nevis hydro-electric scheme has now been reduced to one—Aims of Industry Ltd. This is the result of the latest action by the National Trust for Scotland who are again to suggest to the Secretary of State for Scotland that there should be discussion on hyrdo-electric development. Chairman of the Council of the Trust has said it is hoped that Aims of Industry Ltd. will now accept some more flexible procedure in order to allow rational discussion of the larger issues.

Fenner in Africa

LAST year J. H. Fenner and Co. Ltd. formed an African subsidiary to expound the company's interests in that sphere. Since then negotiations have been completed for the acquisition by Fenner (Africa) of a controlling interest in an engineering company in the Johannesburg area. This forward programme now provides for the development of the new organisation, to be known as Fenner KSG Manufacturing Co. (Pty) Ltd., by adding to its existing range of production.

Refrigerator sales out of the red

REFRIGERATOR sales by area boards were 2·9% higher last November than in November, 1959—the first rise for any month, compared with a year earlier, since credit restrictions were imposed last April. As recently as September, refrigerator sales were still over 40% lower than a year earlier, but in October the gap was reduced to only 9·7%.

Weakest link in the Board's sales in November was washing machines, as the table below shows. This was a repetition of the previous year's pattern, suggesting that there is a seasonal element in the decline. Only one in three of British households have a washing machine, so there is still plenty of scope, and the manag.ng director of Radiation Ltd. has revealed that overtime is being worked on production lines of the washing machine which his firm introduced last July, in the heart of the recession.

Appliance sales by area boards	Sales in month ended 30 Nov., 1960		Sales in 12 months ended 30 Nov., 1960	
	Total	% change over corresponding period of 1959	Total	% change over corresponding period of 1959
Cookers ...	32,563	+ 3·2	340,895	+ 1·7
Water Heaters:				
Immersion	9,920	+21·9	191,354	+ 0·7
Storage ...	5,368	− 2·5	68,069	+13·6
Washboilers	4,463	−10·8	56,948	−16·5
Washing Machines ...	8,223	−35·7	117,022	−30·5
Refrigerators	5,677	+ 2·9	140,592	−15·6
Clothes Dryers ...	8,806	−25·4	62,318	not avail.

Scottish contractors in Wage Talks

A WAGE increase for journeymen electricians in Scotland is now the subject of discussions between the Electrical Contractors' Association of Scotland and the ETU. This follows the recent 1s an hour award to operatives in England and Wales.

Belfast's New Plan

An artist's impression of the new electrical and mechanical engineering building planned for Queen's University, Belfast, is shown alongside. Due to be occupied by October, 1963, it will bring together in one block the electrical and engineering departments now occupying temporary premises. The block will come under the joint authority of Queen's University and Belfast Corporation on behalf of the College of Technology. Architects for the project are Cruikshank and Seward, of Manchester

Move towards block-storage heaters for homes

LATEST move to have block-storage heaters introduced into UK homes comes from Midlands Electricity Consultative Council. The hold-up at present is the purchase-tax position; they are exempt for commercial use and, hitherto, the makers have not wished to jeopardise this advantage by putting the domestic case to the test. However, last month's exemption of domestic systems of electrical central heating, provided designed output is not less than 30,000 B.Th.U./hr, may make a difference. Now the Consultative Council has decided to seek the views of the MEB as a preliminary step to approaching the Electricity Council. Already limited in domestic potential by their initial cost and installation problems arising from their weight, block-storage heaters would probably find a small domestic market if subjected to the 25% purchase tax applicable to many popular forms of household heating. Without purchase tax, the prices of block - storage heaters which might be adapted to domestic use range from around £12 for a 1 kW model to about £22 for 3 kW capacity.

Another resolution of last week's Council meeting, with a bearing on off-peak storage methods of heating, was a decision to ask the MEB for an assurance that off-peak tariffs would not be withdrawn or the differentials reduced. The Birmingham representative's suggestion that consumers needed this assurance before incurring capital expenditure on floor-warming installations met with wide support.

On a recommendation from the North Staffordshire Committee, following representations from the British Pottery Manufacturers' Federation, the Council decided to approach the MEB on the question of certification of meters used for consumers on maximum-demand tariffs. The pottery manufacturers have been urging an approach to the Ministry of Power for an amendment in legislation to provide for certification of these meters. Mr F. W. Martin, of Birmingham, said other manufacturers had raised the same problem and, in some cases, had put in duplicate meters to check the Board's meters.

Board loses damages claim

A CLAIM for £130 damages by the South Wales Electricity Board against Swansea Contractors Ltd., whose employees were alleged to have damaged a cable, was rejected in Swansea County Court last week. For the Board it was claimed that employees of the contracting firm damaged the underground cable at Southend, Mumbles, when laying a water pipe near to an ice-cream kiosk. In some places the cable was only a foot down because of the rocky nature of the ground. After the water pipe had been laid, within inches of the cable, it was found that the latter had been punctured and water had seeped through the insulation. The defendants had not consulted the Board before laying the cable.

It was stated that none of the contractors' employees reported striking the cable. One man who used a pneumatic drill on part of the job said he had not used it on the particular section deeper than two inches, the remainder of the work being done by hand tools for "safety sake."

Giving judgment and costs for the contractors, Judge H. Trevor Morgan said there was no doubt a puncture in the cable had caused a failure, but it was difficult to establish when the damage was caused. He thought there would have been more evidence if the drill had struck the cable.

NEW GROUP IN AFRICA

THE electrical and machinery side of the business of United Africa Co., a widely diversified trading organisation controlled by Unilever, is being formed into a separate group. The group will include a company in London called United Africa Mechanical and Electrical (UNAMEC), which will provide buying services for its associates. Other companies in the new group are: in Nigeria and Ghana—UAC (Technical), Pan Electric, Ghana Consolidated Machinery and Trading Co., Ghana Pan Electric, together with certain service organisations; and in East Africa—the domestic electrical business and machinery division of Galey Roberts Co.

OFFICIAL PUBLICATIONS

Interim Report on Accidents in Glasgow Suburban Electric Trains on 13 and 17 Dec. HMSO. 1s (see page 131).

Hire-purchase and Credit Sale Agreements (Control) (Amendment) Order, 1961. SI No. 53; Control of Hiring (Amendment) Order, 1961. SI No. 54 (see page 149).

Consumer Protection Bill. HMSO. 9d (see page 148).

BS 2960. Dimensions of three-phase electric motors with ventilated enclosures. 6s.

BS amendment slips: 941 Automobile filament lamps. Amendment No. 2. PD 3986; 1361, Cartridge-fuses for domestic consumers' units. Amendment No. 4. PD 3956; 3028, Electric vacuum cleaners for use in hospitals. Amendment No. 1. PD 3996; CP 327.201, The reception of sound and television broadcasting. Amendment No. 1. PD 3955.

SHEFFIELD RETAILERS OPPOSE 'FRIDGE RENTAL PLAN

TO fight a proposal of Sheffield City Council's Housing Management Committee to rent electric refrigerators to Council house tenants, electrical retailers and wholesalers in Sheffield are setting up a local Electrical Retailers' Protection Association. These firms maintain that the Council's plan to rent refrigerators for 2s 6d a week would severely cut their business. Presiding at the open meeting before the Association was constituted last Thursday, Mr H. E. Dilly, of Henry Wigfall Ltd., emphasised that a tremendous amount of refrigerator business would be lost unless they did something about it. They had to fight the plan because if it was accepted without any protest it would only be the beginning of the matter. Next they may find the Corporation intending to supply cookers or cleaners. The fact that it had been done in other towns should make the electrical traders even more keen to see that it was not done in Sheffield, he added. Mr Dilly was elected secretary of the Protection Association, with Mr F. Whittles as chairman, Mr C. Law, treasurer, and Messrs A. Webb, H. H. M. Sugg, R. Maltby and F. C. Snelson as members of the Committee.

It was decided to seek further details of the Council plan for presentation to a further meeting next week.

MODERNISING CATTERICK

As part of an extensive work programme being carried out by the Army at Catterick Camp, Crompton Parkinson Ltd. were awarded the contract for the complete changeover of the electrical distribution system from 3·3 kV to 11 kV. The contract comprised 77 units of indoor and outdoor h.v. switchgear, 26 outdoor substation transformers up to 500 kVA, together with the supply and laying of 17 miles of cabling for the ring main system. Our illustration alongside shows one of the 500 kVA 11 kV/433 V substations

Tanker Contract

GENERAL ELECTRIC CO. was a supplier of auxiliary power units and switchgear for the 20,000-ton motor tanker *Montana*, built by Sir James Laing and Sons Ltd., of Sunderland, for the Norwegian owners, Tanktransport (Thorvald Berg). Most of the auxiliaries are electrically driven, power being supplied by three GEC Accurex-controlled self-excited alternators. Other equipment provided by GEC includes over 30 electric motors of 1½ to 68 h.p. and the combined main and group starter switchboard.

Two of the alternators controlled by the switchboard are 330 kW, 412·5 kVA, 440 V three-phase, 60-cycle diesel-driven machines, while the third, of 300 kV, is turbo-driven. All three are arranged for parallel operation on a fully insulated system. A feature of the alternators is that all excitation and voltage regulator components are completely static.

Export guarantees up

THE Export Credits Guarantee Department insured one-fifth of all export business in 1960, commercial guarantees amounting to £694·5 million. The proportion of business covered rose slightly, for while exports were 6% higher guarantees rose by 8·8%. In the last quarter, certain electrical equipment contracts accounted for £7·3 million of guarantees.

CO-OPERATION IN ELECTRICAL EXPORTS

COLLABORATION in the promotion of exports—that is the aim of a plan applauded by over 130 export managers and senior executives of the electrical industry at the special meeting called by BEAMA last week. The plan is that the Association should arrange to put firms in touch with makers of complementary equipment with a view to joint sales efforts, market research and collective exhibitions abroad.

As an initial step, firms are being asked to indicate on a questionnaire the type of equipment it is planned to export, the overseas territories in which they would like to co-operate, and whether they are prepared to share any existing facilities abroad.

At last week's meeting it was generally agreed that pooling of resources could be advantageous in the most competitive markets. There was also a suggestion to send small teams representing groups of manufacturers to overseas countries, including places behind the Iron Curtain.

Several of the largest firms in the industry offered to provide help to smaller firms manufacturing complementary products by sharing their overseas facilities and, in a somewhat similar scheme initiated by the *Daily Sketch*, firms such as Electrolux, English Electric, GEC, Harland Engineering, Marco, Pye and Thorn have expressed willingness to participate.

Export Markets Changing—G.E.C. Chief

THE radical changes taking place in export markets and the steps needed to meet the situation were highlighted by Mr A. Lindley, chairman and managing director of General Electric Co. this week when he issued the company's quarterly export guide. The Common Market, ever-growing industrialisation in formerly undeveloped countries, and the need for prompt deliveries and local knowledge are factors which led Mr Lindley to lay great stress on the need for British companies to establish assembly and manufacturing plants abroad and to keep in the forefront of technological advance, with the attendant investment and research.

"We have passed the psychological stage of 'success by exhortation'," Mr Lindley said. "We must create a home climate in which exports thrive, which implies devoting as much effort and study to overseas as to domestic markets' needs." As the Six's common external tariff developed Britain would find it increasingly difficult to compete, but as the Common Market had been taking 15% of our exports, with Germany our fourth largest customer, we must not allow trading relations with the Six to erode.

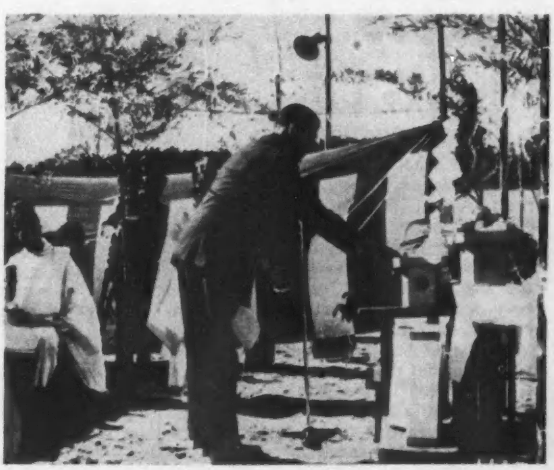
Of the 34 countries examined by the GEC export survey team, the outlook is said to be good in 19, including West Germany and Italy; deteriorating in 10, among which are Australia, USA and India; improving in Argentina, Iraq and Portugal; and unchanged in France and Belgium.

"Misled by C.E.G.B." M.P. protests on Berkeley effluent

DISCLOSURE of the CEGB's plans for disposing of slightly radioactive air and water from Berkeley nuclear station has brought quick complaints from Gloucestershire. The Conservative MP for South Gloucestershire, Mr F. V. Corfield, has sent a letter to the Minister of Power stating that he was misled by CEGB planners, who had positively assured him in his talks with them that there would be no question of radioactive discharges. Consequently, Mr Corfield says he agreed to support the project and spoke in favour of it at an explanatory conference for the local public. The Board's experts repeated these assurances at the conference, he said.

The complaints appear to have been touched off by a letter from the Minister of Housing to Dursley RDC asking for observations on an application by the CEGB for authorisation to discharge liquid and gaseous radioactive wastes from the 275 MW station, which is expected to go critical this year. Told that the Board wished to make a continuous discharge of air used in cooling and to empty into the Severn water used for washing the hot fuel elements after extraction from the reactor, the Council's health committee expressed shock and concern, despite the fact that the Minister said he was satisfied that radiation would be well below the maximum international level.

The CEGB have declined to comment yet. There was no public inquiry before Berkeley was approved in 1956 because the county authorities did not object. It is understood that the question of effluent has not altered since then, but the matter has been highlighted now by the need under the Radioactive Substances Act to obtain approval for discharge from the Minister of Housing.



Dr H. K. Cameron, manager of GEC's Atomic Energy Division, taking part in the Shinto religious ceremony which marked the inauguration of the second stage in the construction of the 150 MW nuclear power station at Tokai-Mura, in Japan

The new 25,000 sq ft factory of Contactor Switchgear Ltd. at Leominster is now in operation making the cubicles and components for electrical control gear. The factory has been built on a 5½-acre site acquired a few years ago. Last Thursday, the Mayor of Leominster, Councillor C. P. Goodwin, supported by members of the Council and civic officials, visited the factory. Our picture, alongside, shows the mayor and others of the party during the visit

S.T.C.—Submarine Cables share £18m order

THE largest-ever order for submarine cable has just been placed. Standard Telephones and Cables Ltd. and Submarine Cables Ltd. (in which AEI and BICC each have an interest) are to manufacture the 8,700 miles of submarine telephone cable and 335 submerged amplifiers for the Pacific section of the Commonwealth round-the-world cable. Under the conditions of the £18 million contract, as much as possible of the raw material is to be supplied from Australia and Canada.

The Pacific cable will go from Canada to New Zealand and then on to Australia. The stretch between Sydney and Auckland will be laid first and is due to go into service by July next year; work has already started on the terminal installations. The whole Pacific cable is scheduled for completion in mid-1964. Cost of this cable, approved seven months ago, is being met by the Governments of UK, Canada, Australia and New Zealand. The next phase, from Australia through India back to the UK, has already been approved in principle by the Commonwealth Governments and will be carried out as finance and resources become available. On the other side of the world, laying of the trans-Atlantic section will begin next summer.

ELECTRIFICATION IN EIRE

BY March, 1962, every parish in Eire will be connected to the Electricity Supply Board's rural network, Mr P. J. Dowling, engineer-in-charge of rural electrification, told members of Dublin Rotary Club last week. To date, some 720 of the 791 areas in the country had been connected and in those areas 75% of the householders had taken a supply. On power utilisation he referred to a good farming area where, about eight years after the supply being extended, 77% of the consumers had an electric iron, 88% a radio, 20% an electric fire, 22% vacuum cleaners, 27% a pump for water supply, 46% a kettle, 31% a cooker, 14% a washing machine, 10% a refrigerator and 14% a water heater.

New H.P. Scheme for Industry

A NEW scheme for financing capital expenditure on major industrial equipment is put forward by Engineering Finance, a member of the United Dominions Trust group. This involves a long-term hire purchase agreement, with the equipment itself as normally the only security, and the finance charges calculated on the reducing balance at an interest rate linked to Bank rate. It is suggested that the scheme will aid industrial concerns in undertaking re-tooling programmes without recourse to raising permanent capital, or disturbing bank and other credit lines.

SUPERHEATED STEAM CONFERENCE

THE effect of superheat on heat transfer when condensing steam will be discussed at a conference to be held on 14 March and 15 March at the National Engineering Laboratories, East Kilbride. The aims of the conference are to make clear existing knowledge on a rather controversial subject and to ensure that the work of the laboratory is focused on the problems of most concern to industry. Discussion will mainly be informal, but a few papers will be presented. Further details may be obtained from the Director (Heat Division), National Engineering Laboratories, East Kilbride, Glasgow.

400 kV LINE IN SUFFOLK

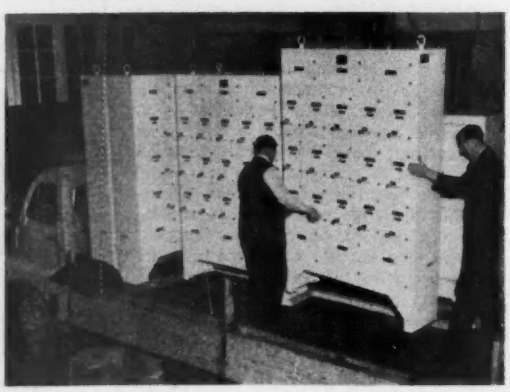
THE CEGB have agreed to route the new transmission line from a proposed substation at Bramford to Sundon (Beds), through West Suffolk on roughly the same line as existing overhead lines. The new line is at 400 kV, the County Planning Officer, Mr J. M. Gorst, reported to the County Planning Committee last week. The Board earlier proposed to route the new line—from Sizewell nuclear station, through over 28 miles of Suffolk countryside. The new route, with 158 high steel towers about 400 ft apart, will transverse some 11 miles of the south west corner of the county.

Plan to use Blue Streak

BLUE Streak is well to the fore in proposals for the joint development of a heavy satellite launcher by British Commonwealth and European countries to be considered at an international conference beginning at Strasbourg on 30 Jan. The venture, sponsored by Britain and France, envisages the co-operative exploitation of satellites for communications and other peaceful purposes. Mr Thorneycroft, Minister of Aviation, who will be chief British representative at the conference, visited Rome and Berne last week winding-up a series of curtain-raiser talks.

SINGER'S LATEST VENTURE

FOLLOWING an experimental period of selling the Parnall "Vibra-beat" vacuum cleaner, the Singer Sewing Machine Co. have now launched a campaign for their own "Golden Glide" and "Magic Carpet" vacuum cleaners. The former, selling at £29 19s 6d, is being made for them under licence by the Parnall section of Electrical Division of Radiation Ltd., whose "Vibra-beat" it closely resembles in shape. The "Magic Carpet," an upright stick and bag type, is imported from Singer's USA manufacturing plant, we are told.



Loading a 3½ ton consignment of electric motor control gear at the Brighton works of Allen West and Co. for transport to London Airport, from where it was flown to Uganda. The equipment will control processes in cleaning and classifying tobacco leaf crop at the Kampala works of the British-American Tobacco Co. Ltd. A central push-button panel will control 92 motors totalling 304½ h.p.

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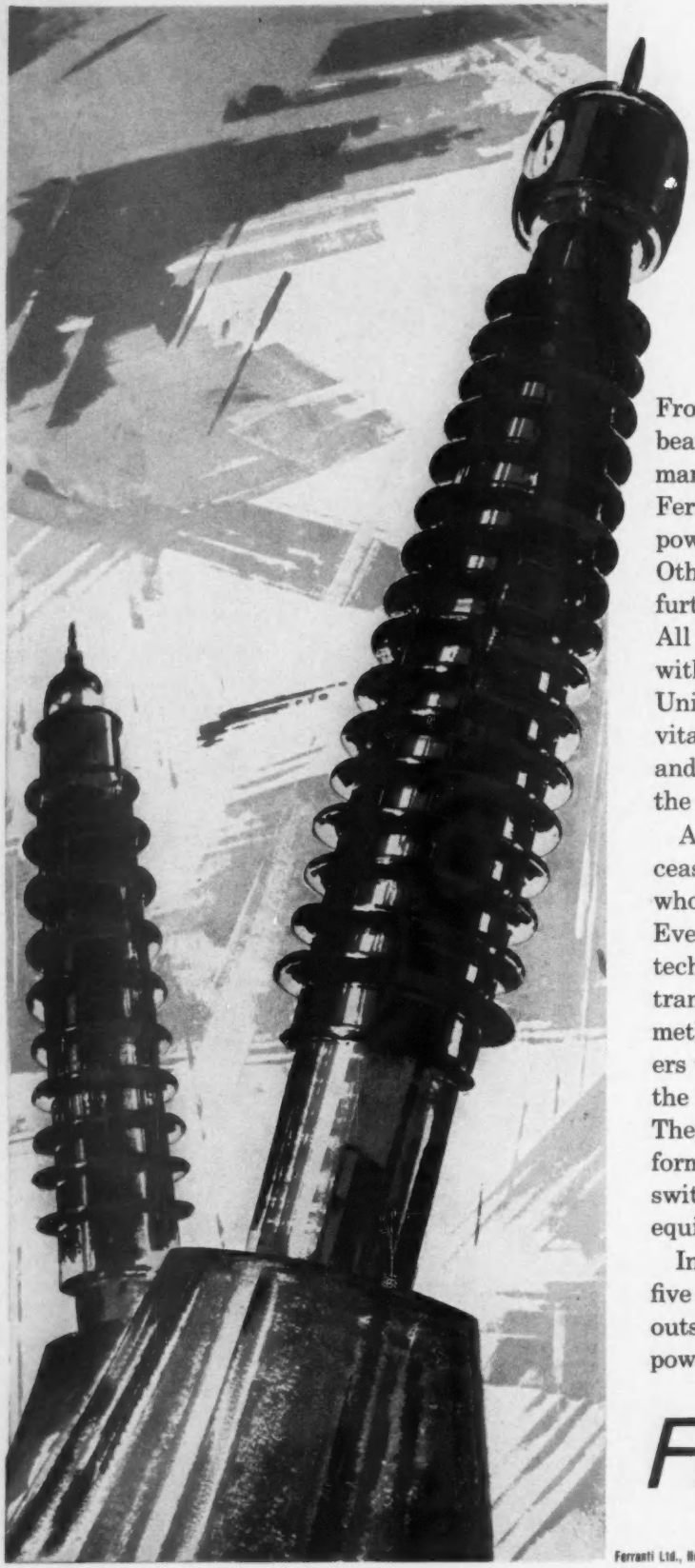

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One million miles logged by trolley-bus

WHILE London is selling off its trolley-buses, Bradford is giving one of its veteran double-deckers a little extra work so that it will have clocked one million miles in time for the service's golden jubilee in June. Bus No. 603, almost 26 years old, has already run over 970,000 miles, but Bradford City Transport do not consider it too late to give her another coat of paint for a few more years of life. Bradford and Leeds were the first towns in the country to use trolley-buses—both services beginning on 20 June, 1911.

LARGE CONTRACTS

ORDERS for further extensions to the furnace installation at the United Wire Works Ltd., Edinburgh, have been placed with Efco Ltd. They cover a 200 kW pitpot furnace for bright annealing phosphor bronze wire and a bell furnace installation with two 200 kW furnaces and eight bases.

THE South of Scotland Electricity Board have awarded to AEI Construction (Cables and Lines) Division a contract for supply and installation of over 12 miles of 11 kV and lower voltage paper and varnished cambric insulated cables and over 12 miles of l.t. cables for the 60 MW extension at Braehead power station.

PELAPONE Ltd. are to supply automatic standby diesel alternator sets for Western Region, BR signal boxes at Old Oak Common, West Drayton, Maidenhead and Reading East.

AIRFIELD surveillance radar for the RAF has been ordered from Cossor Radar and Electronics Ltd. by the Ministry of Aviation.

Sayings OF THE WEEK

"It is to be regretted that many public authorities, having called for competitive tenders, will not reveal to the unsuccessful bidders a list of the amounts of these various tenders." . . . MR DAVID J. FURSE, writing to the *Financial Times*.

"Customers are fed up with the failure of British manufacturers to meet delivery dates, and the finest salesman in the world cannot hope to be continually successful against a background of broken promises." . . . MR R. S. REDMOND, managing director, Heyes and Co. Ltd., addressing Wigan and District Local Productivity Association.

"In the all-electric flats in Kirkcaldy it had been found that miners were living cheaper there than in houses where they could use the cheap coal available to them." . . . MR A. K. DAVIDSON at Stirlingshire Education Committee's discussion on school heating.

PRICES of cable metals and other materials

Figures quoted are the official prices ruling on Tuesday, January 24

	£ per ton	Weekly change £
COPPER, standard class A (settlement)	220	+3½
" (3 months)	220½	+2½
LEAD, refined pig, 99·97% purity (cash)	63⅜	−⅜
" (3 months)	64⅛	−⅛
TIN, refined, min. 99·75% purity (settlement)	781	—
" (3 months)	785	+½
ALUMINIUM, ingots 99·99·5%	186	—
" wire bars (4×4×54")	193½	—
BRASS Strip 63/37	195½	+4
SILVER (Troy oz)	79⅛d	—
ZINC, virgin, min. 98% purity (cash)	78½	−1½
" (3 months)	78½	−½
RUBBER, per lb No. 1, RSS, spot	24d	−⅛d
c.i.f. basis, ports, March	24d	−⅛d
ARMOURING: Galv. Steel Wire (0·104 in.)	68	—
Mild Steel Tape (0·04 × 1½ in.)	53*	—
NICKEL (home)	600	—
MERCURY (76 lb flask)	69	—
AMERICAN PRICES: Copper, electrolytic (per lb)	29c	—
Lead, (New York)	11c	—

* *Tape Price, now an average, includes varnishing*

E.D.A. HEATER OFFER AT IDEAL HOME SHOW

IMMERSION heaters will get a seasonal boost at the EDA stand at the *Daily Mail* Ideal Home Exhibition at Olympia from 7 March to 3 April. Consumers in the London, Southern, South Eastern and Eastern areas will be offered complete installation of a 3 kW unit for £14 10s, provided the householder's tank and fittings are in order. Visitors will also be able to order on the spot, anything from dishwashers to whole-house heating.

Approaching from the main avenue, visitors to Stand 57 in the Grand Hall will encounter the underfloor heating and water-heating features, while those who enter from the lateral gangway will meet with an animated display based on the current EDA advertising campaign. The exhibit will show visitors the advantage to be gained if they "Plug in to Electric Living."

Chloride in Australia

THE first section of a new industrial battery production plant at Padstow, New South Wales, has been opened by Associated Battery Makers of Australia (Pty) Ltd., a subsidiary of the Chloride Electrical Storage Co. Ltd. When completed towards the end of 1962, the plant will occupy an area of 19 acres. Founded in 1930, the Australian company initially began manufacture of small batteries and has since expanded its range.

GALLERY LIGHTS

LOUVRE lights set in the roof will be a feature of an art gallery to be incorporated in a new building being erected for the Commonwealth Institute in Kensington High St. Both natural and artificial light will be diffused through 144 compartments in the roof. As daylight fades, colour-corrected fluorescent tubes will automatically switch on to maintain an even light. The lighting in each unit can be adjusted individually to suit the works of art beneath.

News in Brief

A Southend-on-Sea Electrical Circle has been formed with Mr J. Linton as president, Mr F. Emerson, chairman, and Mr E. R. Feather, secretary.

Annual conference of the Electrical Contractors' Association of Scotland is to be held at Dunblane Hotel Hydro, from 12 to 14 May.

All 1,200 production workers at the Luton refrigerator factory of Electrolux Ltd. started a four-day week last Monday.

Carlisle City Council are to take over maintenance of street lighting in the city.

A diesel-electric ship to carry 1,750 tons of Portland cement in bulk, launched at Leith last week, will have three GEC tandem generators coupled to Belliss and Morcom diesel engines supplying power for both propulsion and for loading and discharging.

The East Midlands Electricity Board have opened a new service centre at 628 Mansfield Rd, Nottingham.

Benjamin Electric Ltd. recently held their fourth two-day course and conference for sales representatives of electrical wholesalers at their Tottenham works.

130 employees and friends attended the London Electric Wire Co. and Smiths' head office staff annual dinner and dance recently.

A strikingly designed circular building with under-pavement heating will house an MEB showroom at an American-style drive-in shopping precinct to be built at Kingswinford.

Hoover Ltd. have opened a new apprentice training school at their M.rthyr Tydfil factory.

Night storage heaters have recently been installed in several lighthouses on the East Anglian coast.

Builders of private housing estates should install street lights at the time of building the houses in the view of Shropshire Association of Parish Councils. The Association will write to all rural councils urging the adoption of this method.

OVERSEAS NEWS

from our correspondents abroad

CANADA

UK Consultants to Appraise Columbia-Peace Schemes

Quite a lot of newsprint and political controversy has been devoted in Canada to the relative merits of the Columbia and Peace River schemes. Recently we reported that the Government of British Columbia had given the BC Energy Board the job of analysing the merits of the two schemes. The Board have now appointed two British consultants, Sir Alexander Gibb and Partners and Merz and McLellan, to investigate the cost of power generated from the Columbia and Peace scheme and the relative costs of electricity supplied to consumers from these two major schemes. Some Canadian reports suggest that the study may cost more than $1 million and that the British consultants were called in to rule out any possibility of bias on the merits of the two schemes. The report prepared by the consultants, which it is hoped will be completed by July, may indicate whether the two projects can proceed together and which is likely to be started first. On 17 Jan. President Eisenhower and Mr Diefenbaker signed a treaty for joint development of the Columbia River which has been under negotiation for about 16 years. The treaty will run for 60 years and covers construction of dams on both sides of the border.

First Power Export Licence

The first licence for export of electrical power from Canada to the United States was granted recently by the National Energy Board. The Board, established last year, is now the sole body for authorising all such power exports and the results of renewal applications are being watched with interest. Twenty applications are at present before the Board and the first licence granted covers the export of electricity generated by Canadian coal across the St. John River. The decision is hardly unexpected for the power export is between two sections of the same paper mill and has been annually licensed since 1926.

Plastics Submarine Cable

A submarine polyethylene insulated 12 kV cable has been laid experimentally by the NB Power Commission between Campobello and Casco Islands. The experimental cable is 4,500 ft long and it will be examined after a test period.

U.S.A.

Costs May Prove Costly

It is reported that the 19 electrical firms that recently pleaded guilty to acting in restraint of trade or else who offered "no defence" pleas will soon face a damage suit filed by the US Government. The two largest firms involved are General Electric and the Westinghouse Electric Corporation. It is alleged that the Government has been overcharged by tens of millions of dollars from 1951 to 1960 under private arrangements between the companies to quote high prices for generators, transformers and other heavy equipment supplied to the TVA, the Atomic Energy Commission and other Government departments. It is reported that since the conspiracy was first attacked last February, price of some electrical equipment has been reduced by as much as 30%. Under the False Claims Act, the Federal Government can sue for $2 damages for every dollar overcharged and some sources put the amount overcharged in excess of $200 million.

MEXICO

Mexico Buys Japanese

That Mexico was the best South American customer of the Japanese electrical industry was stated by the representative of Tokyo Shibaura Electric at the recent inauguration of the El Fuerte hydro-electric station. The Japanese company provided two 22 MW generators for the station. They have also supplied three 58 MW generators for the Mazatepec plant, now under construction, and a further two 36 MW water-turbines for the Santa Rosa power station.

ITALY

Possible 300 MW Thermal Plant

An intensification of the plans for industrial development of Sardinia is included in current plans by the Italian Government. One of the developments proposed for the island, construction of a 300 MW thermal plant to burn low-grade fuel, has been the subject of discussion between English Electric representatives and the Italian Government for some time. Although no results of these discussions have so far been reported, a recent speech by the Minister of the Budget, Signor Pella, suggests that the power plant will be part of a 15-year development plan, and as he also omitted to refer to the submarine cable across the Tyrrhenian sea linking Sardinia to the mainland, previously envisaged, it seems reasonable to suppose that electricity generated at the station may well be used for local industries rather than export to the mainland.

EGYPT

Applying High Dam Power

A contract to investigate industrial development on the basis of power obtainable from the Aswan High Dam has been placed with the British consultants, Andrew Crookston and Co. Ltd. The contract, valued at £55,000, covers feasibility reports and proposals for industrial development during the United Arab Republic's Five-year Plan. It will be recalled that the High Dam is being built by Russia and is scheduled for completion in 1970.

S. AFRICA

SA Exports Washing Machines

The potential demand in Europe for South African designed and manufactured spindryer washing machines is reported to be sufficient to justify a company establishing an assembly plant in Holland. It is intended that assembly will begin at the plant in March.

PAKISTAN

Dissatisfaction at Quetta

A demand that the Quetta Electric Supply Co. should be taken over by the Government has been made by representatives of Union Committees in the town. The Committees allege mismanagement by the company and high charges for electric power in the town. Last week we recorded that a loan for a new 15 MW station at Quetta had been approved by the Development Loan Fund.

INDIA

Light Shortage in New Delhi

An unexpected result of the Queen's current Royal visit to New Delhi has been a sudden shortage of light bulbs. Local suppliers are reported to be hoarding stocks and prices up to ten times normal rates are being quoted following release of plans for large-scale illumination of the city. In consequence the New Delhi municipal committee has now decided to buy 20,000 bulbs in Calcutta.

Mr Nehru Opens Trombay

India's experimental Trombay reactor was opened officially by Mr Nehru on 16 Jan. Speaking at the opening the Atomic Energy Commission's chairman, Dr H. J. Bhabha, said that since the formal inauguration of the Trombay establishment, a number of new facilities and reactors had been built, including

a uranium metal plant, a fuel fabrication facility and a zero energy reactor, for lattice investigations. He said India had provided its own scientific and technical personnel from the beginning of the reactor construction. The Trombay reactor is heavy water moderated and has so far operated up to power levels of 17·5 MW. In the next few months it is expected that the output will rise to 40 MW. Dr Bhabha said that India had negotiated a broad agreement with the Soviet Union, to be signed later this year, for co-operation in peaceful uses of atomic energy. The Trombay reactor, built jointly with Canadian assistance, is similar to the reactor under construction at Chalk River except that a pure water primary circuit is cooled by sea water flowing through a secondary circuit.

More Colombo Plan Aid

A $25 million grant for capital assistance under the Colombo Plan has been made by Canada to India for the year 1960-1. The grant will finance a number of industrial developments, including part of the third stage of the Kundah hydro-electric project in Madras State.

Durgapur First Set Tested

First of two 75 MW units in the Damodar Valley Corporation's new station at Durgapur was successfully tested recently. Some concern has been expressed about the delay in commissioning, amounting to 18 months, and said to be caused by failure of some machine parts on test. The contract for the machinery was awarded to a West German firm and a firm of US technical consultants was responsible for erection.

FAR EAST

Railway Development Loan

A four-year programme to improve railway services on the Burma railways is to be financed in part by a $14 million loan from the World Bank. The Burma railways extend for 1,860 route miles and the modernisation plan provides for diesel-electric locomotives, railcars and signalling equipment.

Japanese Power Loan

Under the terms of the Japan-Vietnam reparations agreement, a loan of 2,700 million yen has been agreed to finance hydro-electric development projects. The loan will assist construction of the proposed Danhim hydro-electric power station and associated power distribution systems.

Java Hydro Project

Construction work on a $50 million flood control, irrigation and hydro-electric plant is expected to begin in East Java in 1962. The scheme, financed through Japanese war reparations to Indonesia, will be constructed by Nippon Kui Eng. on the Brantas River. Estimates suggest that the river is capable of generating 75 MW.

Hydro Contract Signed

It is reported that a contract has been signed to prepare project reports for a hydro-electric and irrigation scheme in Thailand on the Nam Pong tributary of the Mekong River. The project will be financed largely by the UN Special Fund and the contractors are Rogers International Corporation.

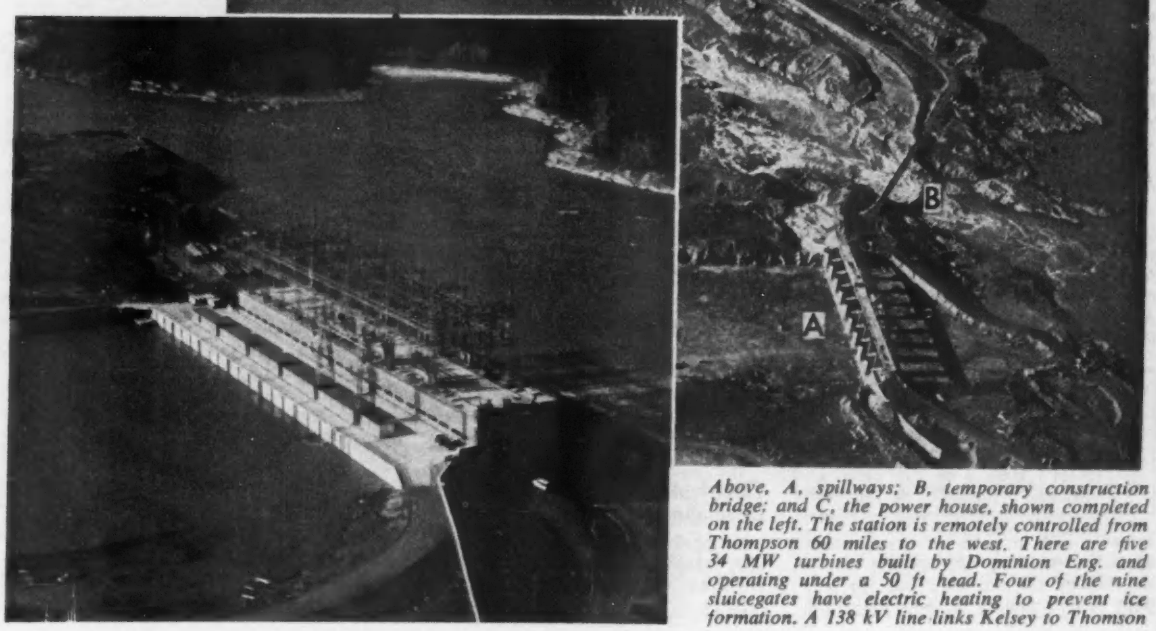
AUSTRALIA

Vales Point Ash Plant Contract

The Electricity Commission for New South Wales has awarded a £463,650 contract to John Thompson Industrial Constructions for ash collection and disposal plant at the Vales Point power station. The plant will be required to handle 1,900 ton of ash and 350 ton of fly ash daily. It will also collect and dispose of pyrites from the pulverising mills. Fly ash will be collected by pneumatic suction and discharged by hydraulic ejectors to a disposal lagoon. Vales Point station, on the shores of Lake Macquarie, is about 70 miles north of Sydney. It will ultimately have a capacity of 875 MW.

KELSEY

The 169 MW Kelsey hydro-electric station, commissioned a few months ago by the Manitoba Hydro-Electric Board



Above, A, spillways; B, temporary construction bridge; and C, the power house, shown completed on the left. The station is remotely controlled from Thompson 60 miles to the west. There are five 34 MW turbines built by Dominion Eng. and operating under a 50 ft head. Four of the nine sluicegates have electric heating to prevent ice formation. A 138 kV line links Kelsey to Thomson

Company Activities

ONCE again it seems stock markets had anticipated the event. Indeed, what an intelligent entity the amorphous "market" proves to be! So although last Thursday's relaxation in h.p. controls which extended the maximum repayment period from two to three years caused a certain amount of "after hours" share dealing excitement, the following day's business was inclined to see a number of prices drop back. In fact, the City summed up the market effect of the Government's leniency with the two words—"damp squib." Directed principally to aid the faltering motor-car industry—it is now working at about 60% of capacity—this minor extension of h.p. freedom was greeted with very little enthusiasm by domestic appliance manufacturers. They had been hoping in addition to the three-year repayment period for a minimum deposit down of 10%. Especially in the case of refrigerators, they do not feel that the new regulations are sufficiently elastic to allow the clearance of piled-high stocks before the spring-time buying surge is again upon them.

How, then, did share prices in the electrical market respond to the news of "three years to pay"? Hoover's 5s "A" Ordinary shares, which started out the week at 43s 9d but which had dropped to 42s 3d before the news, were marked up after the announcement to 43s. Thorn Electrical were unchanged on the week at 46s 7½d although they had been down earlier to 46s 3d. With the "big three," AEI went 3d better to 41s 9d, although the findings of the interim report on the Glasgow electric train transformers left them 1s weaker over the week at 41s 6d. GEC, unchanged on the h.p. news, were 10½d a share cheaper by the week-end at 31s 6d, and likewise English Electric was unchanged by the "three years" at 33s 9d. Compared with a previous Friday's price of 21s 9d, E. K. Cole, merged into new form with Pye as British Electronic Industries, saw the price of these new 5s Ordinary shares start stock market life at 14s 9d. Pye's last independent price had been 14s 10½d. BEI finished its first week, however, at 14s. The merger terms, it may be recalled, were one 5s Ordinary share in BEI for every 5 Ordinary in Pye and three BEI shares for every two 5s Ordinary shares in E. K. Cole.

Elsewhere in the electrical market, we had Berry's Electric ex the one-for-three free scrip issue at 37s 7½d against 51s 3d in the old form, so that the shares were in effect 9d lower on the "split." International Computers and Tabulators, whose deputy chairman, Col A. T. Maxwell, tells me we can reckon on an annual ICT rate of growth of about 16% to 18%, were extremely strong, forging ahead over the week from 66s 3d to 70s 3d after 73s. A fortnight or so ago on the "rights" issue news the shares went as low as 58s 9d. Ether Langham Thompson, the makers of temperature and process control equipment, saw an unaccustomed degree of activity in their 5s Ordinary shares on takeover rumours. Although denied by the board, the shares' net gain over the week amounted to 2s 7½d at 27s 4½d. Other bright features included Dimplex 2s 9d dearer at 55s, Plessey 1s 3d stronger at 50s 3d and AB Pictures 10½d better at 47s 1½d on the encouraging half-yearly figures.

Whether justified or not, there is a mood of optimism moving now into the market. If the repayment h.p. relaxation did nothing to immediately stimulate the market it must at least provide another underpin to prevent any serious sagging in the weeks ahead. And for the majority of electrical shares the prospects cannot be said to be at all drear or dismal.—*From our City Correspondent.*

Arcolectric (Holdings) Ltd.

After taxation charge of £59,973 (*£44,855*), consolidated net profit for the year to 31 Oct. last is £60,935 (*£55,053*). A final dividend of 7½% again makes the total 15%. The directors report that Arcolectric (Switches) Ltd. did not feel the full effect of recessions in the car industry and in parts of the electrical appliance industry during the period covered by the accounts, but the company is now finding business more difficult and more competitive. Extension to the factory has not yet proved possible as difficulties have to be met, due to town planning consents. Other building plans are under consideration.

Year to 31 Oct.	£ Trading Profit	£ Net Profit	% on Ord.		Ord. Price	
			Earned	Paid	High	Low
1958	20,489	9,022	19	7½	2/5	1/6
1959	108,135	50,053	98	15	3/10	2/1
1960	135,502	60,935	119	15	5/6	3/6

British Industrial Plastics

Turner and Newall are making an offer for the Ordinary capital of this concern. They are to offer one £1 Ordinary share of Turner and Newall plus 28s cash for every seven BIP 2s Ordinary.

Electrical and Industrial Development Co.

Net profit for 1960 is £124,730 (*£106,939*) after taxation charge of £85,000 (*£75,800*). Deferred Ordinary dividend is 130% (*110%*).

General Cable Manufacturing Co.

Operations for the year ended 30 Sept. last resulted in a loss of £38,737, compared with a profit of £68,886 in the previous year. After all charges, but before tax, the group loss is £92,508 (*£20,786 profit*).

Goblin (BVC) Ltd.

The difficult conditions affecting the domestic appliance industry are reflected in the sharp drop in profits by the concern for the year ended 30 Sept. last. The group profit before taxation amounts to £114,422, compared with £250,540 last time, after absorbing losses in certain subsidiary companies including an overseas subsidiary in which a further charge for doubtful debts of £11,479 has been made against the general revenue reserve of that company. UK taxation absorbs £72,495 (*£128,488*) leaving a net profit of £40,806 (*£125,797*). The ordinary dividend is cut by 2½% to 10%. It is added that the subsidiary companies in aggregate show a net trading loss.

Home Telerentals Ltd.

Announcing an unchanged interim dividend of 6% on the increased capital, the directors report that group profits have been running at approximately the same rate as last year.

Radio and Allied (Holdings)

Although the interim Ordinary dividend for the year ending 30 April next is again to be 7½%, the directors warn that group turnover for the first eight months of the period showed a material reduction. Stocks have been kept down, however, and the liquid position continues to be healthy and they anticipate that a reasonable profit will be earned for the current year although it is likely to be appreciably lower than that for last year.

Ultra Electric (Holdings) Ltd.

With an announcement of an unchanged interim dividend of 7½% for the year to 31 March, 1961, the directors warn that the outcome of the current year's trading will not be as favourable as last year. Profits have been affected on the radio and TV side and action has been taken to bring operations into line with current conditions to enable a return to more profitable trading. The level of activity of the Electronics company has been maintained and the outlook for the remainder of the year appears satisfactory.

Westool Ltd.

The authorised capital is being raised from £20,000 to £200,000 and of the new £1 shares which have been created, 14,000 are being made available for subscription by senior executives. Pointing out that this increase in capital reflects the substantial progress made by the company in recent years, Mr A. Hunking, managing director, states that there is no intention at present of making any public issue of shares.

COMMERCIAL INFORMATION

Contracts Open at Home . . .

Dates given are the final for receipt of tenders unless otherwise stated.

27 Jan.—Luton T.C. Electrical installation, 18 flats, Lewsey Farm.—See 19 Jan. issue.

27 Jan.—Maidstone B.C. Provision and installation of water heaters plus wiring renewal in 89 houses.—See 19 Jan. issue.

28 Jan.—Mitford and Launditch R.D.C. Electrical installations in four pre-war houses, Hardingham. Council Clerk, M. Turnbull, The Guildhall, East Dereham.

28 Jan.—Otley U.D.C. Supply and erection of 95 tubular steel columns/brackets with 400 W colour-corrected mercury side entry lanterns/lamps/gear along 1·8 miles, A660.—Advertised 5 Jan. issue.

30 Jan.—Manchester C.C. Supply and installation of cables and ancillary equipment for power and control at Arnfield Treatment Wks.—Advertised 12 Jan. issue.

30 Jan.—Manchester C.C. Supply and installation of five centrifugal pumps, motors, switchboard, etc.—See 19 Jan. issue.

30 Jan.—Manchester C.C. Electrical installations: Contract 282, 142 dwellings, Harpurhey; Contract 298, 240 dwellings, Rose Hill, Marple.—Advertised 19 Jan. issue.

30 Jan.—Northern Ireland Housing Trust. Electrical installations in 145 dwellings at Roseville, Lisburn. Trust Offices, 12 Hope St, Belfast 12.

31 Jan.—Poole B.C. (9) Electrical installations and (10) lantern lights in 76 houses, Turlin Moor estate; and shop and flat, Alderney West estate.—See 19 Jan. issue.

1 Feb.—Durham C.C. (b) Electrical installations in Felling Leam Lane Community and Youth Centre and Leasingthorne County Junior and Infant School. Applications to County Architect, South St, Durham, by above date.

1 Feb.—Friern Barnet U.D.C. Supply: lamps.—Advertised 12 Jan. issue.

3 Feb.—Belfast C.C. Supply and erection of air heater cleaning equipment at Power Station West.—Advertised 5 Jan. issue.

3 Feb.—Felling U.D.C. Supply of lamps for year. Applications, enclosing s.a.e., to Council Surveyor, Council Bldgs.

3 Feb.—Gt. Yarmouth B.C. Supply: cables.—Advertised 19 Jan. issue.

3 Feb.—Manchester C.C. Electrical installations: Contract 326A, 326 dwellings and five shops, Miles Platting; and contract 346, 12 houses, Wythenshawe. Director of Hsg, Town Hall.—Advertised in this issue.

4 Feb.—Consett U.D.C. Supply of street lighting lamps for year. Surveyors Dept, Council Offices, Medomsley Rd.

4 Feb.—Edinburgh Northern Hospitals. Maintenance of electrical installations and equipment; lifts in five hospitals for year. Applications to Secretary and Treasurer, Board of Management, Ferry Rd, Edinburgh 5, by above date.

4 Feb.—Rishton U.D.C. Supply, erection and cabling of 27 Group "A" mercury units on concrete columns. Engineer and Surveyor, Council Offices, Rishton, nr. Blackburn.

6 Feb.—Caerphilly U.D.C. Supply of (Item 15) lamps and (16) road lighting electrical equipment. Engineer and Surveyor, Council Offices.

6 Feb.—Camberwell B.C. Group "B" sodium lighting on steel columns, comprising 238 60 W, 65 85 W, and 15 140 W.—See 19 Jan. issue.

6 Feb.—Carmarthen C.B.C. Supply of (List P) electrical goods for year. Borough Engineer, Municipal Bldgs, John St.

6 Feb.—Chadderton U.D.C. Supply: lamps.—See 19 Jan issue.

6 Feb.—Duffield P.C. Supply and erection of 74 concrete columns and 140 W sodium lanterns along A6. Council Clerk, L. A. Stiles, 30 Wirksworth Rd. Deposit £2.—Advertised in this issue.

6 Feb.—Leeds T.C. Supply: lamps.—See 19 Jan. issue.

6 Feb.—Manchester C.C. Electrical installation in conveniences, Piccadilly. City Architect, P.O. Box 488, Town Hall.

6 Feb.—Staffs C.C. Street lighting at Watling St: (a) Gailey roundabout, (b) Muckley Corner roundabout and (c) Fazeley roundabout, totalling 25 points with 200 W linear sodium lamps on 30 ft steel columns.—See 19 Jan. issue.

6 Feb.—Strabane R.D.C. (b) Electrical services in Council Offices reconstruction. Details from consulting engineers, W. and M. Given, 3 Richmond St, Londonderry. Deposit £3 3s.

6 Feb.—Uxbridge B.C. Supply of (List 15) lamps for year. Borough Surveyor, 263 High St.

6 Feb.—Worsley U.D.C. (1) Electrical installation in Town's Yard extension. Engineer and Surveyor, Town Hall, Walkden. Deposit £2 2s.

6 Feb.—Wrexham B.C. Supply: c.i. 15 ft columns/brackets; totally enclosed lanterns; chokes and capacitors; 80 W colour-corrected m.v. lamps.—Advertised 5 Jan. issue.

7 Feb.—Dublin C.B.C. Supply of 1,000 aluminium spearheads for lamp brackets and 900 lanterns.—See 19 Jan. issue.

8 Feb.—Cardiff C.C. Electrical installations in: (a) County Primary School, Pen-yr-Heol, Llanrumney; (b) proposed Police Station, Llanishen. Deposit £2 2s, made payable to Corporation.

8 Feb.—Solihull B.C. Supply: fittings and lamps.—See 19 Jan. issue.

8 Feb.—Wathamstow B.C. Supply of (List 24) cords and cables; and (25) lamps for year. Engineer and Surveyor, Town Hall.

9 Feb.—Cheadle and Gatley U.D.C. Supply of lamps and lanterns for year. Applications, enclosing foolscap s.a.e., to Engineer and Surveyor, Town Hall, Cheadle.

9 Feb.—Sittingbourne and Milton U.D.C. Electrical installation, by contractors on N.I.C.E.I.C. roll, in 98 houses, Barrow Grove housing estate. Engineer and Surveyor, 89 London Rd, Sittingbourne. Deposit £3 3s.

10 Feb.—Holywell Hospital Committee. Supply: lamps and cables.—See 19 Jan. issue.

10 Feb.—Neston U.D.C. Installation work in 82 houses.—Advertised 12 Jan. issue.

13 Feb.—N.I. Hospitals Authority. Supply: electrical requirements.—See 19 Jan. issue.

13 Feb.—Royton U.D.C. Supply of (c) lamps for year. Engineer and Surveyor, K. Halliwell, Town Hall.

13 Feb.—Sunderland C.B.C. Electrical installations in 260 dwellings, Town End Farm Estate. Borough Architect, Grange Hse, Stockton Rd.—Advertised in this issue.

13 Feb.—Tynemouth C.B.C. Supply of lamps, cable, lighting columns, lanterns, fittings and housing electrical accessories for year. Borough Surveyor, D. M. O'Herlihy, 16 Northumberland Sq, North Shields.

14 Feb.—Barnsley C.B.C. Supply of concrete columns, public lighting tungsten, mercury vapour and sodium lamps for year. Borough Engineer and Surveyor, Town Hall.—Advertised in this issue.

15 Feb.—Crompton U.D.C. Supply: lamps.—See 19 Jan. issue.

15 Feb.—Edinburgh C.C. Supply of aluminium alloy fluorescent bulkhead fittings. Engineer and Manager, Lighting and Cleansing Dept., 329 High St.

15 Feb.—Fylde Water Board. Flow and pressure recording apparatus and remote supervisory control equipment for Wyre La Borehole.—Advertised 19 Jan. issue.

15 Feb.—Keynsham U.D.C. Electrical installations for 11 shops and one supermarket at Bath Hill. Architect, Council Offices, Keynsham, Bristol. Deposit £2 2s.

16 Feb.—King's Lynn B.C. Supply and erection of three centrifugal pumps at No. 2 pump station. Borough Engineer, H. G. Ridler, 17 Queen St. Deposit £2 2s.

17 Feb.—Belfast C.C. Supplies lists: (Form 22) bare h.d. copper conductors and cables; (23) street lighting equipment including columns; (24) transformer kiosks, h. and l.t. switchgear; (25) o/h line equipment; (26) m.i.c.s. cables, etc.; (27) thermal insulation repairs; (28) Bitite strip, jointing tape, joint-box compounds; (29) rubber insulated and p.v.c. insulated cables and flexible cords; (30) lamps; (31) clothing, rubber jointings, etc.; (32) immersion heating equipment and lagging jackets; (33) alkaline batteries and chargers; (34) 6·6 kV ring main and switch-fuse units; (36) accessories, kettle and washboiler elements; (37) cooker boiling plates; (38) medium voltage h.r.c. cartridge fuse links: (39) wood poles. Electricity Dept., East Bridge St, Belfast 1. Fee 10s each form.—Advertised in this issue.

17 Feb.—Staffs Potteries Water Board. Electrically driven pumping plant—six 2¼ m.g.d. vertical pumps for rain water and ditto for clear water, all with Laurence Scott motors.—See 19 Jan. issue.

Your Queries Answered

Readers are invited to make use of our free enquiry department which possesses wide resources, including an index of trade information with over 100,000 entries

A Selection from the 112 queries answered this week

"Latralok" fusegear—address for? E.E.B.—Dexray Engineering Ltd., 34 Ardwick Green South, Manchester 13.

"Dri-Clo" clothes drying cabinets—makers of? F.W.H.—Dri-Clo Ltd., 1a Sugar La, Manchester 4.

Chas. Alexander and Co. Ltd.—address for? S.E.—Madison Hse, Molesey Ave, West Molesey, Surrey.

Magnetic door gaskets—makers of? S.W.—Goodyear Tyre and Rubber Co. (Great Britain) Ltd., Bushbury, Wolverhampton; Refrigerator Components Ltd., 2 Greycoat Pl, S.W.1.

"Rowlett" toasters—makers of? T.B.—Rowlett Eng. Co. Ltd., East Rd, Burnt Oak, Edgware, Middx.

"Sinex" vibrators—makers of? K.W.—Sinex Eng. Co. Ltd., Central Way, North Feltham Trading Estate, Feltham, Middx.

"Thor" washing machines—address for? J.P.E.C.—Parnall (Yate) Ltd., 255 North Circular Rd, N.W.10.

"Demag" taper rotor motors—agents for? L.E.—Acrow (Engineers) Ltd., 7 South Wharf, W.2.

"Newtons of Taunton" rectifiers—address for? L.E.B.—Crypton Equipment Ltd., Bristol Rd, Bridgwater, Somerset.

"Clukes" electric clippers—makers of? T.E.—Clukes Ltd., 215 Putney Bridge Rd, S.W.15.

17 Feb.—Staffs Potteries Water Board. Two sets of diesel-driven alternators, each 500 kVA, 415 V, 3-ph., 50 cycles, 428 r.p.m., with switchgear, cabling, etc., for Tittesworth reservoir scheme.—See 19 Jan. issue.

18 Feb.—Maesteg U.D.C. Supply of (List 22) electrical fittings for year. Engineer and Surveyor: L. W. Jones, Council Offices.

18 Feb.—Merthyr Tydfil C.B.C. Supply of (List 8) electrical goods for year. Borough Engineer and Surveyor, Town Hall.

20 Feb.—Nottingham C.C. Two centrifugal pumps, motors, switchgear, etc., for Normanton-on-the-Wolds. — See 19 Jan. issue.

21 Feb.—Salford C.C. Supply of: (1) 15 ft concrete columns; (2) 60 W sodium lanterns/ancillary equipment; (3) 100-150 W Class H lanterns; (4) time switch/fuse boxes; (5) solar dial synchronous time switches for year. Street Lighting Superintendent, 9 Frederick Rd, Pendleton, Salford 6.

21 Feb.—Tyrone C.C. (iii) Electrical installation in new technical institute at Dungannon.—See 12 Jan. issue.

23 Feb.—Isle of Axholme R.D.C. Contract 2: Supply and erection of sewage ejectors and sludge pump complete with motors, starters and accessories for West Butterwick scheme. Details from consulting engineers, John H. Haiste and Ptnrs, Belmont Hse, 20 Wood La, Leeds 6. Deposit £3 3s.

27 Feb.—Golborne U.D.C. Supply of Class "B" concrete and c.i. columns, totally enclosed lanterns, sodium lamps and control gear for 188 lighting units. Engineer and Surveyor, Council Offices, Lowton, nr. Warrington. Deposit £2 2s.

6 March.—Airdrie B.C. Supply of (h) lamps for year. Town Clerk, J. Taylor, Municipal Bldgs.

21 March—Bedfordshire C.C. (b) Electrical installation, on fixed-price basis, in proposed Clapham/Oakley County Secondary School.—See 19 Jan. issue.

No date stated—Chigwell U.D.C. New main road lighting.—See 19 Jan issue.

. . . and Overseas

*Details of items marked * may be obtained on application to the Board of Trade, Lacon Hse, Theobalds Rd, W.C.1, quoting reference.*

1 Feb.—Canada. Six 69 kV disconnecting switches. Chairman, Committee on Utilities and Personnel, c/o City Clerk, City Hall, Winnipeg 2. B.o.T. (ESB/519/61).*

9 Feb.—India. 23 items including: ammeters, voltmeters, transformers, motor testing equipment, etc., and machine tools 8 items. Executive Engineer (P), National Coal Development Corpn, Chief Purchase Office, Darbhanga Hse, Ranchi. B.o.T. (ESB/566/61).*

14 Feb.—India. Transmission line equipment (excluding towers) for 66 kV single circuit Dhulkote-Patiala-Sangrur line and 132 kV single circuit Bhiwani-Dadri line. Superintending Engineer (Projects), Punjab State Electricity Board, Patiala. B.o.T. (ESB/687/61).*

14 Feb.—Pakistan. 20,000 dry cells 2¼ in. by 6¼ in. Chief Controller of Stores, Eastern Bengal Railway, Pahartali, Chittagong. B.o.T. (ESB/664/61).*

15 Feb.—India. Testing equipment for meters and relays. Superintending Engineer (Proc), Rajasthan State E.B., Power Hse, Jaipur. B.o.T. (ESB/559/61).*

15 Feb.—Kuwait. House service cutouts, connector boxes, cable end boxes, pole-mounted terminal boxes, etc. President, Dept. of Electricity, Water and Gas. B.o.T. (ESB/468/61).*

16 Feb.—Pakistan. 50 d.c. neutral line resistance 1,000 ohms relays. Chief Controller of Stores, Eastern Bengal Railway, Pahartali, Chittagong. B.o.T. (ESB/665/61).*

20 Feb.—India. 110 kV transformers. Mysore State Electricity Board, Bangalore 1. B.o.T. (ESB/690/61).*

24 Feb.—Costa Rica. One 60 metric ton o/h travelling crane. La Proveeduria, Instituto Costarricense de Electricidad, San Jose. B.o.T. (ESB/381/61).*

27 Feb.—India. Reclosers 15 A to 50 A maximum voltage 14·4 kV. Mysore State E.B., Post Bag 15, Bangalore 1. B.o.T. (ESB/535/61).*

6 March.—India. Two 132 kV transformers for Pathankote sub-station and two 10 MVA 66/11 kV transformers for Panipat. Executive Engineer, Punjab State E.B., Dharamsala. B.o.T. (ESB/620/61).*

8 March.—Egypt. Two 5 MW turbo-generators complete with auxiliary transformers and boilers for Damanhour Power Station. Ministry of Public Wks, Mechanical and Electrical Dept, Cairo. B.o.T. (ESB/33314/60).*

13 March.—Pakistan. 19 400 V motors, specifications EB/EE/39 and 44. Chief Controller of Stores, Eastern Bengal Railway, Pahartali, Chittagong. B.o.T. (ESB/666/61).*

CONTRACTS PLACED

British Railways (N.E. Region). Newport, near Middlesbrough, marshalling yard. Signalling control equipment for 30 track miles, Westinghouse Brake and Signal Co. Ltd.; yard floodlighting, substation equipment and 59 miles signalling and power cables, British Insulated Callender's Cables Ltd.

C.E.G.B. Contracts placed during December amounting to £7,305,000 include: Drakelow C power station: circulating water pipework for units 9-12, Aiton and Co. Ltd. Skelton Grange B power station: one 144 MVA, 132 kV generator transformer No. 14, Hackbridge and Hewittic Electric Co. Ltd. Richborough power station: railway sidings, Grant-Lyon and Co. Ltd.; booster and main boiler feed pumps for No. 3 unit, Harland Engineering Co. Ltd. Oldbury nuclear power station: circulating water system, river works and site preparation, Sir Lindsay Parkinson and Co. Ltd. Thorpe Marsh power station: building and civil engineering works at 275 kV substation, Mitchell Construction Co. Ltd. Pyle substation: one 45 MVA, 132/66/33 kV transformer and earthing transformer, English Electric Co. Ltd. Finsbury Market substation: three 15 MVA, 132/11 kV transformers, Ferranti Ltd. Three Bridges substation: 132 kV switchgear, English Electric Co. Ltd. Elstree substation: 132 kV switchgear, A. Reyrolle and Co. Ltd. Wickham Market substation: 132 kV switchgear, Associated Electrical Industries Ltd. Barking substation: 275 kV isolators, A. Reyrolle and Co. Ltd. Whitson substation: 275 kV switchgear, A. Reyrolle and Co. Ltd. Carrington substation: 275 kV switchgear, Associated Electrical Industries Ltd. Whitfield substation: site and foundation works, G. Percy Trentham. Brinsworth substation: foundations, Tarmac Ltd. Ffestiniog power station: 16 kV and lower voltage cables and earthing, Pirelli-General Cable Works Ltd. Northfleet power station, east and west substations: 132 kV cables, Pirelli-General Cable Works Ltd. West Didsbury—Rifle Rd: 132 kV cables and multicore cables, British Insulated Callender's Cables Ltd. Exeter Main—Newton Abbot: 132 kV line, Pirelli-General Cable Works Ltd. Holborn—St. Marylebone: 132 kV cables, Pirelli-General Cable Works Ltd. St. Marylebone—Mill Hill: 132 kV cables, Pirelli-General Cable Works Ltd.

Darlington T.C. Electrical work in Barnard Special School extensions, C. Horne and Co. Ltd., £1,158 6s. Recommended.

Port Talbot B.C. Street lighting conversion from gas, Cwmavon Rd, B4286/Velindre and Springfield areas, Abacus Municipal Ltd.

TRADE NOTES

Change of Address. The regional headquarters of Philips Electrical Ltd. are being moved to Highland Hse, on the corner of Waterloo St and West Campbell St, Glasgow. The change is expected to be completed during next week-end, 28-29 January.

As from 1 Feb. the Eastern regional staff of British Insulated Callender's Cables Ltd. will be operating from Friars Walk, Friars Pl, Chelmsford. Telephone: Chelmsford 58171. The region continues under the management of Mr T. C. Johnston.

Denman Electrical Supplies Ltd. have opened new premises in Bristol, the stores and trade counter being at Brunswick Sq, and head office and accounts at 52-54 Newfoundland St (telephone: Bristol 22163).

London Office. Beckman Instruments Ltd. are shortly to open a London sales and service office at 5-6 Nigel Playfair Ave, Hammersmith, W.6.

Importers. The Shawford Control Gear Co. Ltd., has been formed to import from Italy the C.E.M.A. range of control units, pilot lights, switches, contactors, isolators, timers, relays, solenoids, terminal blocks and microswitches. The firm is operating from Midland Terrace, Victoria Rd, Willesden, N.W.10. Telephone: Elgar 7527.

Agencies. Microcell Ltd. have arranged to distribute in the U.K. a special range of plastics designed for the electronics industry made by Emerson and Cuming, of U.S.A.

Redifon Ltd. have signed an agreement with Alden Research Foundation, of U.S.A., for the manufacture and sale of Alden facsimile equipment in the U.K. and N. Ireland.

Oswald King and Co. Ltd., 171 Gravelly Hill, Erdington, Birmingham 23, have been appointed Midland agents for the United Insulator Division of the Telegraph Condenser Co. Ltd.

NEW COMPANIES

Extracted from the Register issued by Jordan and Sons Ltd., 116 Chancery La, W.C.2.

G. Alexander and Partners (Manufacturers) Ltd., 52 Brook St, W.1. Electrical, mechanical, aeronautical, marine, motor, consulting and general engineers, etc. Nom. cap.: £1,000. Dirs.: to be appointed by subs. Subs.: Shirley Hart and Averill Hart.

Allweld Equipment Ltd., 4 Chapel Row, Queen Sq, Bath. Manufacturers of and dealers in dynamos, motors, etc. Nom. cap.: £100. Dirs.: John D. Gray and Denys W. J. Packer.

Birch and Rayner Ltd., 108 Elsey Rd, S.W.11. Electrical contractors, wood turners, etc. Nom. cap.: £1,000. Dirs.: Charles F. Birch, John M. Rayner, Cissie E. F. Birch and Patricia D. Rayner.

Bruce and Goodman Ltd., Marjorie Ave, Boulthan Park Rd, Lincoln. To take over certain assets of the business carried on by A. I. Bruce and N. Goodman at Lincoln; and to carry on business of electricians, etc. Nom. cap.: £1,000. Dirs.: Anthony I. Bruce and Norman Goodman.

Smith Brothers (Easingwold) Ltd., The Market Pl, Easingwold, Yorks. Electrical engineers, etc. Nom. cap.: £2,000. Dirs.: Harold F. Smith and Enid M. Smith.

Starlex Supplies Ltd., Whitehead's La, Bradford-on-Avon, Wilts. To carry on the business of factors of electrical equipment, etc. Nom. cap.: £200. Dirs.: Robert A. Billett and Sylvia M. Billett.

TRADE MARKS

This information is extracted from the Official Journal by permission of the Controller.

Arctic. B979,077. Class 11. Domestic refrigerators, etc. Kingsgrove Ltd., 101 Ladbroke Grove, W.11.

Polaris. 807,547. Class 7. Washing machines, etc. Thorn Electrical Industries Ltd., 105-109 Judd St, W.C.1.

Wimpy Grill. B808,348. Class 11. Electric double-plate contact grills. Stephen Julian Vadasz, 22 Clifton Rd, W.9.

BUSINESS PROSPECTS

Accrington. Lessees of The Royal Factory plan two additional buildings.—B.C. £1,160 lighting conversion scheme planned to provide colour-corrected mercury lamps in Broadway, Peel St, Blackburn Rd, Abbey St and Whalley Rd, in place of tungsten.

Atherstone R.D.C. Community Association Tender: Community Hall on Long St site. Architects, H. N. Jepson and Ptnrs, Midland Bank Chmbrs, Nuneaton.

Barnes B.C. Tender: 12 flats at Lambert Ave. Engineer.

Billingshurst. Davies, Belfield and Everest, 9 Ashley Pl, S.W.1, quantity surveyors for £120,000 home at Ingefield Manor for The National Spastics Society.

Birkenhead. W. T. Harrison and Ptnrs, Knowsley Bldgs,, Tithebarn St, Liverpool 2, plan extensions to Beaufort Rd factory of Moon Bros.

Birmingham. Stevens and Bishtons, Engineering Co., 40 Edward St, plan new Charles Henry St, Highgate area premises. —Metro Tyre Co., 87 Snow Hill, Birmingham 4, plan new Smith St premises.—T.C. Tender: Contract 701-112, one- two- and four-storey dwellings at Gibbins Rd, Selly Oak. Architect.

Blackpool B.C. £5,000 improved lighting scheme.

Brighton. Gotch and Ptnrs, 26 Regency Sq, architects for National Employers' Mutual General Insurance Association offices in Richmond Pl.

Bournemouth. Healing and Overbury, Rodney Lodge, Rodney Rd, Cheltenham, architects for £¼ million extensions planned by Bobby and Co.

Burnley. Joseph Lucas Ltd., North Bridge Wks, plan Eastern Ave area factory.

Camberley. J. B. Anderson, Kings College Hospital, Camberley, architect for extensions to Baldwin Brown Convalescent and Recovery Home.

Cambridge. M. Sheffield and Bristow, 29 Sackville St, W.1, quantity surveyors for £300,000 extensions to university authorities' Biochemistry Department.

Chelmsford. Marconi International Marine Communications Co., plan building on Widford industrial estate land.

Cheltenham. Governors of Cheltenham Grammar School plan £300,000 building.

Chester T.C. Tender: Hoole Secondary Modern School, instalment two. Engineer and Surveyor, 49 Northgate St.

Chesterfield. Alloy Steel and Iron Co., Carbrook St Foundry, Sheffield 9, plan Pottery La land for steel foundry and offices.

Colchester B.C. Tender: 80 accommodation units, comprising 22 houses, 36 flats in three storeys, 22 bungalows and garages on Greenstead site. Vinton Hall, Borough Architect's Department, 64 West Stockwell St.

Coseley U.D.C. Tender: 164 dwellings in two, three and four storeys at Woodcross North Housing site. Clerk.

Coventry Corporation. Tender: 50-place old persons' home at Quinton. Architect.

Derbyshire C.C. £40,000 projects scheme at Chesterfield College of Technology and Clowne and Heanor Technical Colleges. Architect, Matlock.—£291,625 schemes for new buildings, etc., at Matlock Training College. Architect.

Doncaster T.C. Conversion planned of ice-cream depot in Chequer Rd into offices for Borough Architect and staff.—£8,000 improvements planned to old people's home, Western Hospital.—Provision of 39 new street lamps planned at Barnby Dun, £1,404; 41 at Warmsworth, £1,107; eight at Armthorpe, £216; and 50 on Sprotborough Estate of Staveley Builders, £1,350.

Dunfermline. Monotype Corporation, Salfords, Redhill, plan Albeath Rd factory.

Durham C.C. Tenders to be considered for renewing electrical installation at Bowes Museum, Barnard Castle.

Eccles. Ward and Goldstone plan single-storey electrical accessories factory.—Lankro Chemicals plan Delapon plant, Salters La.

Enfield. Scripto Pens, Lockfield Ave, Brimsdown, Enfield, plan single-storey factory building, Lockfield Ave, Brimsdown. —B.C. Tender: 16 houses, Ingersoll Rd. Engineer.

Glasgow. University Court, University of Glasgow, plan new Church St and Dumbarton Rd genetics department.—Corporation E.C. plans technical college, Battlefield Rd.

Grimsby R.D.C. 50 houses and flats at Immingham and eight bungalows, Laceby, planned.—Tenders to be sought for 26 houses at Immingham. Surveyor.—Installations in Council Offices to be modernised and fires replaced by electric heaters. Surveyor.

Haslingden B.C. Street lighting improvements planned.

Heston. Read Manufacturing Co. plan extensions of Springwell Rd, Heston, factory premises.

Heywood. Relighting of Sefton St and Green La planned.

Hitchin. Herts C.C. plans £59,000 health centre.

Irlam U.D.C. Tender: 32 bungalows and communal building at New Moss Rd, Cadishead. Engineer and Surveyor.

Isle of Axholme R.D.C. Surveyor, Crowle, Lincs, plans homes for old people on Crowle Haxey and Epworth sites.

Kendal. Third, fourth, fifth and sixth sections of street lighting scheme plans to be prepared.

Leeds. Town Tailors, Lincoln Wks, Lincoln St, Leeds 9, plan factory on 2½-acre site.—Industrial and Investment Services, 129 Finsbury Pavement, E.C.2, plan redevelopment of former Empire Theatre site in Briggate as shopping centre and offices.

London. Yates, Cook and Darbyshire, 43 Gt. Marlborough St, W.1, architects for Odhams Press printing works at Long Acre and Neal St, W.C.2.—Easton and Robertson, Cusdin, Preston and Smith, 53 Bedford Sq, W.C.1, architects for £120,000 laboratory block planned by Governors of St. Bartholomew's Hospital at Charterhouse St, E.C.1.—Young and Hall, 9 Southampton Row, W.C.1, architects for student nurses' school planned at Ogle St, W.1.—Moiret and Wood, 181 Queen Victoria St, E.C.4, architects for block of flats at South Bank. —Ever Ready Co. (G.B.), plan office block at Holloway Rd and Hercules Pl, N.—Farquharson and McMoran, 14 North Audley St, W.1, architects for divisional police station at Aldermanbury, Wood St, E.C.2.—White and Traviss, 19 Ludgate Hill, E.C.4, architects for Transport and General Workers Union district offices and meeting rooms, Salter St area.—Covell and Matthews, 34 Sackville St, W.1, architects for blocks of five shops and offices, 40 High St, W.3, for Alec Colman Group.—Devereux and Davies, 3 Gower St, W.C.1, architects for 17-storey office block with flats at Park St, N.W.1.—E. Hill and Ptnrs, 22 Borough High St, S.E.1, plan three-storey office block with basement car park, 118 Southwark St, S.E.1.—Lewis Solomon, Keay and Ptnrs, Thavies Inn Hse, Holborn Cir, E.C.1, plan hotel at Grosvenor Sq.—E. A. Stone, Toms and Ptnrs, 28 South Audley St, W.1, architects for Arlington St office building.—R. Seifert and Ptnrs, Red Lion Sq, W.C.1, architects for new buildings at Arlington St, W.C.1.

Luton. A. Swift and Ptnrs, 21 Upper Grosvenor St, W.1, architect for shops and offices for Calgary and Edmonton Land Co.

Manchester. Holland and Hannan and Cubitts (Gt. Britain), 1 Queen Anne's Gate, S.W.1, contractors for extensions to Stokes Rd factory of Metal Box Co.—T.C. Tender: Alterations to Christ the King R.C. school, Newton Heath to form school meals scullery. Architect.

Morpeth. E. E. Robb, 36 Jesmond Rd, Newcastle, consulting engineer for Newcastle Regional Hospital Board's planned extensions to Northgate and District Hospital nurses' training school.

Newcastle. Copley Metal Testing Co., plan workshops and offices at Fisher St, Walker. —Black and Decker Ltd., 126 Heaton Rd, plan workshops and offices.—Stephenson Gillis and Ptnrs, Saville Chmbrs, North St, architects for Ponteland printing works for C. A. Macdonald.

Northallerton R.D.C. Tender: Seven old people's dwellings, Borrowby. Architects, Brierley Leckenby and Keighley, 10 Lendal, York.

Nottingham. Southwell Diocesan Education Committee plans C. of E. grammar school at Western Boulevard.

Otley. U.D.C. plan new street lighting for trunk road through town.

Oxford. University Chest, Clarendon Bldgs, Broad St, Oxford, plans following: Residential college at Holywell Gt. Meadow, Manor Rd; redevelopment of site for new mathematical institute at St. Giles; three libraries at corner of St. Cross Rd and Manor Rd.—Trustees of Queen Elizabeth Hse plan extensions to provide hostel, tutorial rooms and offices at 21 St. Giles.

Peterborough. Joint Education Board plan stage one of new primary school at Wittering. Architect to the Board, Bridge St, Peterborough.

Petworth R.D.C. Tender: 26 dwellings comprising ten houses and 16 flats. Clerk.

Reading. S. Elliott and Sons (Reading) plan drying kiln at their Gosbrook Rd premises.—Wheatley Bryan and Ptnrs, Federal Hse, Down Pl, W.6, to be appointed consulting engineers for Alfred Sutton girls' school.—£¼ million stage two of redevelopment at Royal Berkshire Hospital planned by Oxford Hospital Board.

Redditch. George Homer (Redditch), plans extensions to Salters La factory.—Super Oils Seals and Gaskets, plan Studley Rd factory extensions. — Hymatic Engineering Co., plan two additional storeys for workshop offices.

Salford. T.C. plan £20,000 conversion of side-street lighting during summer.

Sandtoft. Sandtoft Tileries Ltd., plan new tile factory on former aerodrome.

South Shields. Gabriele Bros, 65 Green St, plan Maxwell St factory.

Stevenage. Bowater Packaging plan factory on 17-acre site. Architects, Farmer and Dark, Romney Hse, Tufton St, S.W.1.

Stoke Poges. Cement and Concrete Association, 52 Grosvenor Gdns, S.W.1, plan two-storey laboratory at Wrexham Springs.

Surbiton. Mollart Engineering Co., Hook Rise South, plan factory extensions.

Swindon. C.C. plans extension of Kingshill Maternity Hospital.—Sealey Engineering Co., plan factory and offices on one-acre industrial estate site.

Thatcham. Reeds Ltd., plan laboratory, offices and medical centre.

Twickenham. Mercer and Miller, 10 Manchester Sq, W.1, quantity surveyors for £218,625 Broom Rd boys' school.

Warwick B.C. Tender: Six shops, office and stores in two single-storey blocks and six maisonnettes and two flats over garages with utility rooms forming two three-storey blocks, Percy Estate, central area. Engineer and Surveyor, 23 Jury St, Warwick.

Watford. Pitt and Underwood Ltd., 16 Vale Rd, Bushey, Watford, plan factory and offices at Greycaines industrial estate.—Wakelin and Horne, 4a St. Albans Rd, Watford, architects for pilot factory at Holywell Estate.

Woking. J. B. Marks and Ptnrs, 106 High St, Guildford, are quantity surveyors for £18,000 sterilising unit planned at Rowley Bristow Hospital, Pyrford.

Wolverhampton. Birmingham Hospital Board, Edgbaston, plans stage one of £98,500 reorganisation of engineering services at New Cross Hospital.

MEETINGS TO NOTE

THURSDAY, 26 JAN.

I.E.E. (N. Midlands). Faraday Lecture on "Transistors and All That," L. J. Davies. Town Hall, Leeds. 7 p.m.

A.S.E.E. (S. London). "Airport Control," L. A. Mulligan. Greyhound Hotel, High St, Croydon. 8 p.m.

A.S.E.E. (Southampton). "Flight Refuelling." Polygon Hotel. 7.30 p.m.

FRIDAY, 27 JAN.

I.E.E. (N.E. Graduates and Students). The Graduates' and Students' Lecture: "The Experimental Investigation of Space," P. J. Bowen. Grey Hall, King's College, Newcastle upon Tyne. 6.30 p.m.

INSTITUTION OF PLANT ENGINEERS (Birmingham). "Power Factor Correction of Electrical Plant," G. Hoyland. Imperial Hotel, Temple St, Birmingham. 7.30 p.m.

JUNIOR INSTITUTION OF ENGINEERS. "Pingon Tower Cranes and Their Applications," A. H. Davies. Pepys Hse, 14 Rochester Row, S.W.1. 7 p.m.

SATURDAY, 28 JAN.

WOMEN'S ENGINEERING SOCIETY (London). New Year luncheon. Arts Theatre Restaurant.

MONDAY, 30 JAN.

I.E.E. (N.E. Measurement and Electronics Group). "Radar Observations of Birds and 'Angels'," E. Eastwood. Rutherford College of Technology, Northumberland Rd, Newcastle. 6.15 p.m.

I.E.E. (London Graduates and Students). "Automatic Trunk Dialling," H. E. Francis. Unit Cinema. 3 (Tels) Training Bn., R.E.M.E., Arborfield, Berks. 7 p.m.

ROYAL SOCIETY OF ARTS. Cantor Lecture: "The Chemical and Plastics Industries," James Taylor. John Adam St, Adelphi, W.C.2. 6 p.m.

I.E.S. (Birmingham). "Visual Perception," R. G. Hopkinson. Regent Hse, St. Phillip's Pl, Colmore Row. 6 p.m.

I.E.E. (S.E. Scotland Graduates and Students). "The Application of Electronics to Chemical and Gas Analysis," G. J. Geis. S. of Scotland E.B. Canteen, Dewar Pl, Edinburgh. 7.30 p.m.

A.S.E.E. (N.W. London). "Static Switching Control Systems," J. N. Fletcher. Compass Hotel, Watford. 7.45 p.m.

I.E.E. (E. Anglian). "A Survey of Street Lighting and its Future," W. R. Stevens and H. M. Ferguson. Electric Hse, Ipswich. 6.30 p.m.

TUESDAY, 31 JAN.

I.E.E. (N. Eastern). "The Determination of the Electrical Characteristics of an Arc Furnace," J. Ravenscroft. Workington College of Further Education. 7 p.m.

I.E.E. (N.W. Supply Group). "A Basis for Short-Circuit Ratings for Paper-Insulated Cables up to 11 kV," L. Gosland and R. G. Parr; and "Short-Circuit Ratings for Mains Cables," G. S. Buckingham. Engineers' Club, Manchester. 6.15 p.m.

SOCIETY OF INSTRUMENT TECHNOLOGY. "Instrumentation—Past, Present and Future," L. S. Yoxall. Manson Hse, 26 Portland Pl, W.1. 7 p.m.

WEDNESDAY, 1 FEB.

I.E.E. (Supply Section). "The Protection of High Voltage Insulators from Power-arc Damage," A. E. Guile. Savoy Pl. 5.30 p.m.

I.E.E. (Tees-side). Centre Chairman's address, D. H. Thomas. Cleveland Scientific and Technical Institution, Middlesbrough. 6.30 p.m.

I.E.E. (Rugby). "A Universal Non-Linear Filter," Prof D. Gabor. Rugby College of Engineering Technology. 6.30 p.m.

I.E.E. (Southern). "The Potentialities of Artificial Earth Satellites for Radiocommunication," W. J. Bray. C.E.G.B. Offices, Portsmouth. 6.30 p.m.

I.E.S. (Edinburgh). "Lighting in Industry in the Soviet Union," E. H. Norgrove. Y.M.C.A. Social Room, 14 South St. Andrews St. 6.15 p.m.

I.E.S. (Newcastle). "Hospital Lighting," G. R. N. Chalmers. Room B7, The Percy Bldg, King's College, Queen Victoria Rd. 6.15 p.m.

INCORPORATED SALES MANAGERS' ASSOCIATION. "Consumer Protection—Why it is Necessary!" C. Brook. Caxton Hall, St. James's, S.W.1. 6.30 p.m.

INSTITUTION OF PLANT ENGINEERS (Edinburgh). "Engineering in the Petroleum Industry," W. M. Greenhorn. 25 Charlotte Sq. 7 p.m.

A.S.E.E. (Halifax). "Instrumentation," D. M. Everett. Crown Hotel, Horton St. 7.45 p.m.

A.S.E.E. (N. London). "The Application of Electric Furnaces to the Heat Treatment of Metals," L. G. Palethorpe. Wood Green Civic Centre, Town Hall, N.22. 8 p.m.

A.S.E.E. (S.E. London). "Relays and Control Circuits," Dr W. L. Stern. Eltham Green School, Queenscroft Rd, S.E.9. 7.45 p.m.

A.S.E.E. (Preston). "The Architect and the Engineer in Building Construction," R. Booth. R.A.F.A. Club, East View. 7.30 p.m.

THURSDAY, 2 FEB.

I.E.E. "Silicon Power Rectifiers," A. J. Blundell, A. E. Garside, R. G. Hibberd and I. Williams. Savoy Pl. 5.30 p.m.

I.E.E. (N. Eastern). "Street Lighting," W. R. Stevens, and "A Survey of Street Lighting and Its Future," W. R. Stevens and H. M. Ferguson. Carlisle Technical College. 7 p.m.

I.E.E. (S.W. Scotland). Sixth Graham Clark Lecture: "Engineering and Civilisation," Sir Hugh Beaver. Joint meeting with the Institutions of Civil and Mechanical Engineers. Royal College of Science and Technology, Glasgow. 7.30 p.m.

I.E.E. (Bristol Graduates and Students). "Some Applications of Magnetic Recording," H. M. Harrison. Lecture Theatre, College of Technology, Ashley Down. 7 p.m.

CHELMSFORD ENGINEERING SOCIETY. "Automatic Control of Steel Rolling Mills," W. N. Jenkins. Hoffmann's Social Hall. 7.30 p.m.

I.E.S. (Glasgow). "Office Lighting," L. H. Hubble. British Lighting Council, 29 St. Vincent Pl. 6.30 p.m.

PLASTICS INSTITUTE (Southern). "The First Year of Operation of the Free Trade Area with Particular Reference to Rubber and Plastics," L. L. Gordon. Joint meeting with I.R.I. Southern section. Chemistry Dept., University of Southampton. 7.30 p.m.

A.S.E.E. (Brighton, Hove and District). "Motor Control Centres," N. E. Steptoe. New Imperial Hotel, First Ave, Hove. 7.30 p.m.

I.E.E. (S.E. Scotland). Dance. Charlotte Rooms, Edinburgh. 8 p.m.

CHIEF TECHNICAL ASSISTANTS' ASSOCIATION. "A Visit to Beunos Aires," L. H. Welch. British Lighting Council, Brettenham Hse, Lancaster Pl, W.C.2. 6.30 p.m.

FRIDAY, 3 FEB.

I.E.E. (Medical Electronics Group). Discussion: "Recent Technical Developments in Eye Movement Recording," P. A. Merton and Dr. C. Rashbass. Savoy Pl. 6 p.m.

I.E.E. (N.W. Utilisation Group). Dinner-dance. Locarno Embassy Suite, Washway Rd, Sale. 7.15 p.m.

I.E.E. (N. Ireland). Dinner-dance. Grand Central Hotel, Belfast. 7.45 p.m.

I.E.E. (N. Scotland). Sixth Graham Clark Lecture: "Engineering and Civilisation," Sir Hugh Beaver. Joint meeting with the Institutions of Civil and Mechanical Engineers. Dundee Technical College. 7.30 p.m.

I.E.E. (S. Midland). Annual dinner. Grand Hotel, Birmingham. 7 p.m.

I.E.E. (N.W. Utilisation Group). Annual dinner-dance. Embassy Rooms (Locarno), Washway Rd, Sale. 7.15 p.m.

IPSWICH AND DISTRICT ELECTRICAL ASSOCIATION. Annual dinner. Great White Horse Hotel.

PLASTICS INSTITUTE (N. West). "Plastics in Industry—Domestic Appliances," H. J. Sharpe. Textile Institute, 10 Blackfriars St, Manchester 3. 6.45 p.m.

SOCIETY OF INSTRUMENT TECHNOLOGY (Fawley). "Instrumentation in Radio Astronomy," Dr H. P. Palmer. Admin. Bldg, Esso Refinery. 5.30 p.m.

A.S.E.E. (Liverpool and District). "Static Switching Control Systems," J. N. Fletcher. Industrial Development Centre, M.A.N.W.E.B., Paradise St. 7.30 p.m.

A.S.E.E. (Stoke and Crewe). "Electrical Catering Equipment," H. Meadowcroft. Royal Hotel, Crewe. 7.30 p.m.

SATURDAY, 4 FEB.

A.S.E.E. (Manchester). "Heavy Industrial Control Gear," C. V. Curran. Engineers' Club, Albert Sq. 7.15 p.m.

MONDAY, 6 FEB.

I.E.E. (Mersey and N. Wales). "The Logical Design of Electrical Networks Using Linear Programming Methods," U. G. W. Knight. Royal Institution, Colquitt St, Liverpool. 6.30 p.m.

I.E.E. (S. Midland). "Development of H.V. Air-break Circuit-breakers with Insulated-steel-plate Arc Chutes," F. S. Fay, J. A. Thomas, D. Legg and J. S. Morton. James Watt Memorial Institute, Birmingham. 6.30 p.m.

I.E.E. (S. Midland). "Cosmic Thunderstorms," C. E. R. Bruce. Winter Gdns, Gt. Malvern. 7.30 p.m.

I.E.E. (Maidstone). "Road Heating," L. H. Carmalt. Maidstone Technical College. 7 p.m.

ROYAL SOCIETY OF ARTS. Cantor Lecture: "The Chemical and Plastics Industries," James Taylor. John Adam St, Adelphi, W.C.2. 6 p.m.

N.E. ELECTRICAL CLUB. "Highways of the Air," Captain O. P. Jones. County Hotel, Neville St, Newcastle upon Tyne. 6.30 p.m.

SOCIETY OF INSTRUMENT TECHNOLOGY (Data Processing Section). "The Universal Decision Element," Prof J. E. Parton and A. Rose. Manson Hse, 26 Portland Pl, W.1. 7 p.m.

SOCIETY OF INSTRUMENT TECHNOLOGY (S. Yorkshire). "Some Aspects of Instrumentation in Steelworks," Dr R. H. Baulk. University, St. George's Sq, Sheffield 1. 7 p.m.

SOCIETY OF ENGINEERS. Presidential address. Geological Society, Burlington Hse, W.1. 5.30 p.m.

GAZETTE ANNOUNCEMENTS

COMPANIES ACTS

K. and H. Electrics Ltd. Meeting of creditors to be held at 186 Hammersmith Rd, W.6, on 31 Jan., at 11 a.m., for the purpose of having a statement of affairs laid before them. Secured creditors to lodge details at 550 Fulham Rd, S.W.6, before the meeting.

J. and D. Clayton (Edgware) Ltd. First meetings of creditors and contributories to be held at Room 401, Inveresk Hse, 346 Strand, W.C.2, on 26 Jan., at 2.30 and 3 p.m., respectively.

Merseyside Eng. (Refrigeration) Ltd. First meetings of creditors and contributories to be held at Liverpool Chartered Accountants' Hall, 5 Fenwick St, Liverpool 2, on 30 Jan., at 11 and 11.30 a.m., respectively.

Hones Electric Ltd. Petition for winding-up to be heard before the High Court of Justice, Strand, W.C.2, on 30 Jan. Persons intending to appear to notify S. Tonkin and Co., 3 Berners St, W.1, by 1 p.m., 28 Jan.

Windles (Nelson) Ltd. Creditors to send details to liquidator: E. Moulds, 11 Nicholas St, Burnley, by 31 Jan. Formal notice, all creditors to be paid in full.

Albert Miller and Co. (Southport) Ltd. First meetings of creditors and contributories to be held at office of Official Receiver, West Africa Hse, 25 Water St, Liverpool 2, on 1 Feb., at 11 and 11.30 a.m., respectively.

BANKRUPTCY ACTS

Receiving Orders

Blackpool. L. Jacques, electrical retailer, carrying on business at 134 Moston La, Moston. Receiving order dated 12 Jan.

Kingston upon Hull. M. Dubb, electrical contractor, carrying on business at 204 Boothferry Rd, and 512 Anlaby Rd, Hull. Receiving order dated 16 Jan.

Intended Dividends

Manchester. N. J. Parkes and J. R. Parkes, domestic appliance retailers, formerly carrying on business as Trivox Electric, at 54 Corwen Ave, Harpurhey. Last day for receiving proofs for intended dividend: 3 Feb., to trustee: W. H. Meredith, 20 Byrom St, Manchester 3.

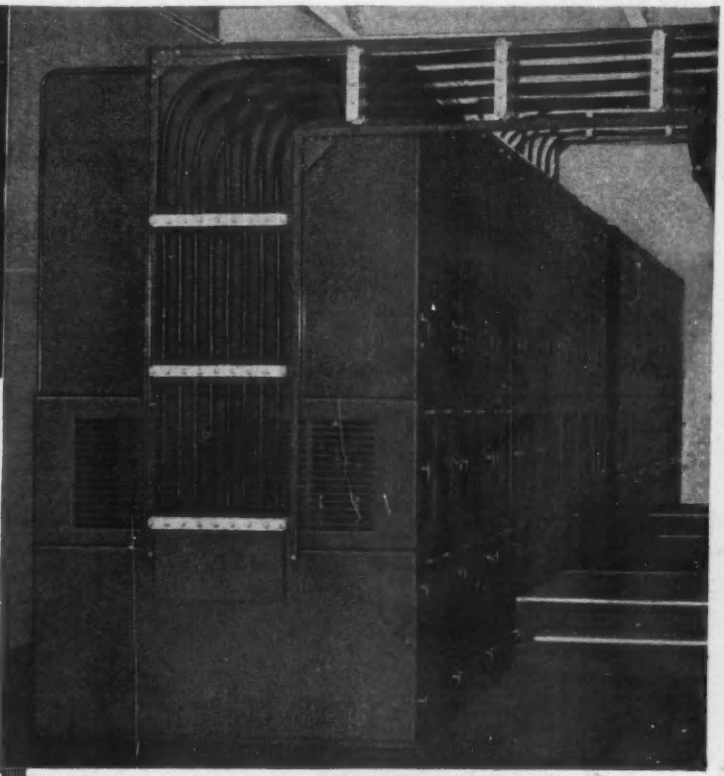
Southampton. J. R. Woods, domestic appliance retailer, formerly carrying on business as Homelectrics at 3 St. Mary's Rd. Last day for receiving proofs for intended dividend: 28 Jan., to trustee: A. H. Horler, 16 Westwood Rd, Southampton.

Dividends

Blackpool. G. Green, battery assembler, carrying on business as Fylde Batteries at 79 Back High St, Blackpool. Dividend per £: 2s 5d, payable at 8 Manchester Rd, Bury, on 31 Jan.

Hanley and Stoke-on-Trent. G. W. H. Pointon, electrician, carrying on business at 33 Churchill Rd, Cheadle. Dividend per £: 3s 2d, payable at 17 Albion St, Hanley, on 31 Jan.

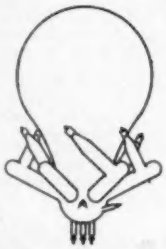
HEWITTIC Cooled-Cathode RECTIFIERS



Increased output -less space

The Hewittic cooled-cathode rectifier is essentially compact and provides a very high capacity within a given floor area.

Right: Two Hewittic cooled-cathode rectifiers forming a 5000 kW bank in the Dover Substation British Railways, Southern Region:



CONVENTIONAL

COOLED-CATHODE

- **Smaller size (see comparison between conventional and cooled-cathode bulbs of same capacity above).**
- **Improved efficiency at lower voltages.**
- **Dependability of bulb maintained.**
- **Ease of installation and maintenance.**

Send for publication R192/1

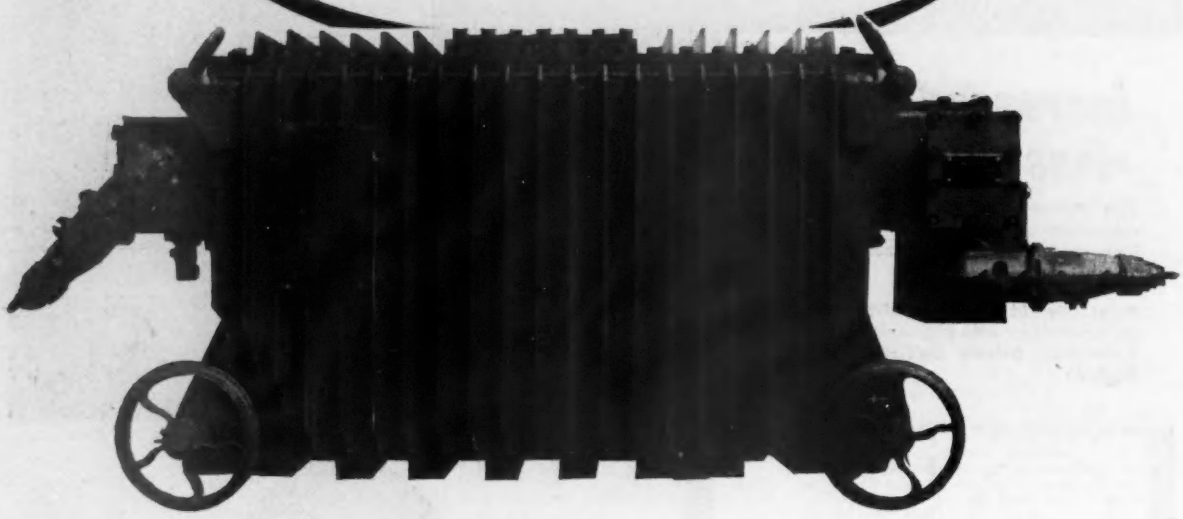
750 kW 3000 volt Hewittic cooled-cathode rectifier bulb

HACKBRIDGE AND HEWITTIC ELECTRIC CO. LTD.

WALTON-ON-THAMES - SURREY - ENGLAND

Telephone: Walton-on-Thames 28833 (8 lines) Telegrams & Cables: "Electric, Walton-on-Thames"

AEI flameproof dry-type class C insulated mining transformer



FLP 4474 Group I

150, 200, 250 and 300 kVA

- Class C insulated
- No fire or explosion risk
- Reduced maintenance
- Can be used right at the coal face, reducing low voltage cable run and consequent voltage drop
- Efficient operation in humid and dusty atmospheres
- Standard mining cable arrangements
- Transwitch* (with certified flameproof circuit breaker) also available

** Registered Trade Mark*

- Robust to withstand roof falls
- Adjustable rail clearance
- Suitable for any rail gauge between 18" and 36"
- Unobstructed access to cover-mounted tap changer handhole
- Long and considerable experience in mining transformer manufacture

For further details write to AEI Transformer Division, Southmoor Road, Wythenshawe, Manchester, 23, or to your local AEI Office.

AEI **Associated Electrical Industries Ltd.**

Transformer Division

MANCHESTER AND RUGBY

E/M 001

CLASSIFIED ADVERTISEMENTS

TENDERS INVITED

E R

By Order of the Secretary of State for War

SALE BY TENDER

Approximately 800 tons of Bare Overhead Wire and Cable Electric P.I.L.C. located at No. 1 E.S.S.D., War Department, Honeybourne, Wilts.

Tenders must be submitted by 17 Feb., 1961.

Applications for Tender Forms should be made to War Office, Directorate of Disposals, First Avenue Hse, High Holborn, London, W.C.1. (T 413)

COUNTY BOROUGH OF BARNSLEY
Borough Engineer and Surveyor's Department
Tenders for Materials 1961/62

TENDERS are invited for the supply of the following materials for the 12 months ending 31 March, 1962:

Concrete Public Lighting Columns.

Electric Lamps for Public Lighting Purposes (Tungsten Filament and Fluorescent Tubes).

Electric Lamps for Public Lighting Purposes (Mercury Vapour and Sodium).

Copies of the Specifications and Forms of Tender may be obtained on application to the Borough Engineer and Surveyor, Town Hall, Barnsley.

Sealed Tenders, in envelopes provided, must be delivered to the undersigned not later than Tuesday, 14 Feb., 1961.

The Council do not bind themselves to accept the lowest or any Tender.

A. E. GILFILLAN,
Town Clerk.

Town Hall,
Barnsley.
Jan., 1961.

(T 434)

BOROUGH OF EALING
Renewal of Electrical Installations at Drayton Infants' School and Perivale Primary School

TENDERS are invited from approved N.I.C.E.C. Contractors for the abovementioned work. Specifications and Tenders from Borough Engineer, Town Hall, Ealing, W.5, on receipt of deposit of £1 each, returnable on receipt of a bona fide tender.

Closing date: 23 Feb., 1961.

E. J. COPE BROWN,
Town Clerk.
(T 398)

COUNTY BOROUGH OF SUNDERLAND

TENDERS are invited for ELECTRICAL INSTALLATION IN 260 DWELLINGS. Tender documents obtainable from Borough Architect, Grange Hse, Stockton Rd, Sunderland. Sealed tenders, endorsed "TENDER FOR ELECTRICAL INSTALLATION—260 DWELLINGS, TOWN END FARM ESTATE," must be received at my office, Town Hall, not later than 13 Feb., 1961.

G. S. McINTIRE,
Town Clerk.
(T 400)

CITY OF BELFAST ELECTRICITY DEPARTMENT
Stores

TENDERS are invited for the supply of the undermentioned materials during 12 months commencing 1 May, 1961:

Form No.

22 Bare Hard Drawn High Conductivity Copper Conductors and P.V.C. Insulated Cables.
23 Street Lighting Fittings, Steel and Concrete Poles and Ancillary Equipment.
24 Transformer Kiosks with High and Low Tension Switchgear.
25 Overhead Line Equipment.
26 Mineral Insulated Copper Sheathed Cables and Terminating Accessories.
27 Repairs to Thermal Insulation.
28 Bitite Strip, Prepared Tape for Joints, Joint Box Compounds and Refined Bitumen.
29 Rubber Insulated and P.V.C. Insulated Cables and Flexible Cords.
30 Lamps.
31 Oilskin or Plastic Clothing, Tarpaulins, Rubber Jointings, etc.
32 Electric Immersion Water Heating Equipment and Hot Water Cylinder Insulating Jackets.
33 Alkaline Switch Tripping Batteries and Charging Equipment.
34 6,600 Volts Ring Main and Switch Fuse Units.
36 Electrical Accessories and Kettle and Washboiler Elements.
37 Boiling Plates for Electric Cookers.
38 Medium Voltage H.R.C. Cartridge Fuse Links.
39 Imported Red Fir Wood Poles.

Note.—Forms Nos. 29, 30 and 31 are in respect of materials which shall be supplied to any Department of the Corporation.

Forms of Tender may be obtained from the Electricity Department, East Bridge St, Belfast 1, on payment of the sum of Ten Shillings (non-returnable) for each form. Extra copies of the forms may be obtained at Five Shillings each (non-returnable). Cheques should be made payable to the Belfast Corporation Electricity Department.

All letters, catalogues, drawings, etc., accompanying tenders must be submitted in duplicate.

Tenderers are advised that the Corporation Conditions of Contract only will apply. Any other conditions put forward by tenderers will not be accepted.

Tenders in sealed envelopes marked "Tender for Stores, Electricity Committee" and endorsed with the name and address of the firm tendering, must reach the undersigned not later than 4 p.m. on Friday, 17 Feb., 1961.

An official receipt must be obtained for each tender delivered by hand. Tenders sent by post should be registered.

The lowest or any tender will not necessarily be accepted.

JOHN DUNLOP,
Town Clerk.

P.O. Box 234,
City Hall, Belfast 1. (T 452)

CITY OF MANCHESTER—HOUSING COMMITTEE

TENDERS invited (returnable 3 Feb., 1961) for Electrical Installations in the following contracts:

Contract 326A: Miles Platting, 326 dwellings and five shops.

Contract 346: Wythenshawe, 12 houses.

Particulars and documents from the Director of Housing, Town Hall, Manchester 2. (T 415)

GHANA SUPPLY COMMISSION
Tenders for Supply of Electric Generating Set

THE Ghana Supply Commission invite manufacturers or, if they cannot themselves quote, their exclusive distributors/sales representative or accredited sales agents in Ghana, to submit Tenders for the following:

Tender Reference
ARMY 4008/1.

Description
ELECTRIC GENERATING SET
DIESEL ENGINE DRIVEN

Forms of Tender and Conditions of Contract are obtainable as from 23 Jan., 1961, on payment of a fee of £1 from the Secretary, Ghana Supply Commission, P.O. Box M.35, Accra, Ghana. The closing date for receipt of tenders will be 23 Feb., 1961. (T 343)

DUFFIELD PARISH COUNCIL
Trunk Road Lighting—A6 Duffield Road

TENDERS are invited for the supply and erection of 74 Concrete Columns, complete with 140 W Sodium Lamp Lanterns.

Specification, Bill of Quantities and Form of Tender may be obtained from the Clerk to the Council, on payment of a deposit of £2, which will be refunded on receipt of a bona fide tender.

Tenders to be returned in plain sealed envelopes endorsed "Trunk Road Lighting—Parish of Duffield" to the undersigned not later than 6 Feb., 1961.

L. A. STILES,
Clerk.

Duffield Parish Council,
30 Wirksworth Rd,
Duffield,
Derbyshire. (T 414)

APPOINTMENTS VACANT

CENTRAL ELECTRICITY GENERATING BOARD
Southern Division

GENERAL ASSISTANT ENGINEERS
SEC/3.128.

APPLICANTS should have served an apprenticeship or had practical training suitable to the industry. They should possess a sound general and technical education and preference will be given to those possessing a Higher National Certificate (or those nearing completion of H.N.C. courses). Opportunities are available for general assistant engineers to complete their studies and gain wide experience with good prospects of promotion.

The duties of those appointed will vary but will come under one of the following main headings:

(a) The construction of transmission lines and sub-stations and the operation and maintenance of overhead lines, cables and associated transmission equipment.
(b) Work associated with protection, communications and electrical plant maintenance.
(c) Operation and/or maintenance of generating station plant including instrument engineering.

Those with good technical qualifications who have not had experience under the above headings will be considered for vacancies as Technical Staff Trainees for appropriate periods prior to appointment as General Assistant Engineers.

Salary for General Assistant Engineers, N.J.B. Scales 2-5, £670/£940 according to experience.

Special application forms, obtainable only from Divisional Secretary, 111 High Street, Portsmouth, should be returned by 8 Feb., 1961. (T 445)

Advertisements should be sent to the Classified Advertisement Dept., Electrical Times, Sardinia House, Sardinia Street, London, W.C.2, before 10 a.m. on TUESDAY of the week of issue. Official Displayed Advertisements are charged at 46s. per inch, and all other classified advertisements at 3s. 6d. per line. Situations Wanted four insertions at twice the single insertion rate. Fee for Box Number and postage on replies 2s.

SOUTH OF SCOTLAND ELECTRICITY BOARD
Edinburgh and Borders Area

THIRD ASSISTANT DISTRICT ENGINEER
EDINBURGH EAST DISTRICT

SALARY: N.J.B., Schedule A, Class G, Grade 9, Salary Scale No. 7, £965/£1,090 p.a.

Applications on the standard form, obtainable from the undersigned, should be submitted not later than 10 Feb., 1961.

Conditions of service will be in accordance with the N.J.B. Agreement and the successful candidate will require to become a contributor to the Board's Superannuation Scheme.

Applicants should have a sound training and subsequent experience with H.V. and L.V. underground distribution systems, including the operation and maintenance of H.V. and L.V. switchgear and cable and a knowledge of protective gear and fault location. The possession of a National Certificate in Electrical Engineering or an equivalent qualification is desirable.

The successful candidate will require to reside within a reasonable distance of District Headquarters.

C. H. A. COLLYNS,
Manager.

52 Melville St,
Edinburgh 3. (T 399)

THE SOUTH WALES ELECTRICITY BOARD

DISTRICT MANAGER
EAST MONMOUTHSHIRE DISTRICT

APPLICATIONS are invited for the post of Manager of the East Monmouthshire District in the Monmouthshire and Mid-Wales Area.

The District has its main office in the new town of Cwmbran and is varied in character, having an important industrial and urban load based upon Pontypool and the adjoining valleys, together with a large rural area to the east of the District, including the Usk and Wye Valleys.

Experience in a senior position in the Electricity Supply Industry is essential, and applicants should possess a recognised professional qualification.

The salary for the position will be in accordance with Class C, Grade 5 of the National Joint Managerial and Higher Executive Grades Committee, namely £2,170/£2,380 per annum.

Applications should be sent to the undersigned at St. Mellons, Cardiff, to arrive not later than Saturday, 18 Feb., 1961.

Please quote reference 7/61/SVN, endorsing envelope "District Manager—East Mon."

R. G. WILLIAMS,
Secretary.
(T 436)

MERSEYSIDE AND NORTH WALES ELECTRICITY BOARD

ASSISTANT SECTION ENGINEER

REQUIRED in the Conway Valley District of the Board's No. 4 Sub-Area. Salary within the range £825/£940 per annum (N.J.B. E/9).

Applicants should preferably have had experience in the construction, operation and maintenance of overhead and underground high and medium voltage networks, with their associated substations and equipment.

Appointment subject to medical examination. Pension Scheme.

Application forms obtainable from the Manager, No. 4 Sub-Area, Electricity Hse, Rhostyllen, nr. Wrexham. Closing date: 6 Feb., 1961.

Previous applicants need not re-apply.
(T 426)

HERTFORDSHIRE

HEATING AND ELECTRICAL ENGINEERS

THE Engineers' Section of the County Architect's Department is being expanded to deal with an increasing volume of building for education and other county services.

(a) PRINCIPAL ENGINEER
(Salary: £1,710/£1,975 p.a.)

The Engineer appointed will be required to take charge of a section of 24 Engineers engaged on the design of heating and lighting installations in a wide variety of county buildings. He should be well qualified, have considerable experience in administration and the control of staff and be prepared to accept delegated responsibility for the work of the section as a whole.

(b) CHIEF ASSISTANT ENGINEER
(HEATING)
(c) CHIEF ASSISTANT ENGINEER
(ELECTRICAL)

(Salary for each post: £1,480/£1,670 p.a.)

These posts offer scope for experienced Engineers conversant with up-to-date developments in their respective spheres and capable of leading the heating and electrical sections which will each consist of about eight assistants.

(d) SENIOR ASSISTANT ENGINEERS
(Salary: £1,310/£1,480 p.a.)
(e) ASSISTANT ENGINEERS
(Salary: £1,140/£1,310 p.a.)

Candidates should be experienced engineers willing to work in collaboration with architects and competent to design installations for major building schemes. The junior posts are for newly qualified engineers who are seeking an opportunity of gaining experience.

(f) TECHNICAL ASSISTANTS
(Salary: £645/£1,140 p.a.)

Required to assist in the preparation of heating, electrical and water service schemes. Applicants should preferably be working on National Certificate courses and be good draughtsmen. Starting salary according to experience. Day release in approved cases.

All posts are permanent and pensionable and car user allowances are available for senior posts. Previous Local Government experience not essential. Further particulars and form of application to be obtained from Geoffrey Fardell, M.B.E., A.R.I.B.A., County Architect, County Hall, Hertford, Herts, to whom they should be returned not later than 13 Feb., 1961. (T 404)

CITY OF MANCHESTER

APPLICATIONS invited for the following permanent appointment in the office of the City Architect.

ASSISTANT ELECTRICAL ENGINEER

The salary is APT. Grade III/IV, £960/£1,310 per annum; the commencing salary will be according to qualifications and experience.

The department has an extensive programme of municipal building work ahead, comprising new abattoirs, libraries, schools, technical colleges, aged persons' homes, etc., interesting and varied work with excellent opportunities for promotion on merit.

Five-day week. Housing accommodation may be provided for a limited period. Removal expenses allowed.

Forms of application from the City Architect, P.O. Box 488, Town Hall. Returnable by 7 Feb. (T 425)

PATENT EXAMINERS AND PATENT OFFICERS

PENSIONABLE posts for men or women for work on the examination of patent applications. Age at least 21 and under 29 on 31 Dec., 1961, with extension for regular Forces service and Overseas Civil Service. Qualifications: normally a degree, or a Diploma in Technology, with first or second class honours in physics, chemistry, engineering or mathematics, or equivalent attainment, or professional qualification, e.g., A.M.I.C.E., A.M.I.Mech.E., A.M.I.E.E., A.R.I.C., A.Inst.P. London salary: £759/£1,704; provision for starting pay above minimum. Promotion prospects. Write Civil Service Commission, 17 North Audley St, London W.1, for application form, quoting **S/128/61.** (T 423)

CENTRAL ELECTRICITY GENERATING BOARD
London Division

APPLICATIONS are invited for the following superannuable post. Conditions of service in accordance with N.J.B. Agreement, Schedule A. Salary includes London Allowance. Qualifications entitling to Graduate Membership of the I.E.E. or I.Mech.E. an advantage.

ASSISTANT MAINTENANCE ENGINEER
(ELECTRICAL)
WEST HAM POWER STATION
Vacancy No. 61/44.

Sound practical and technical training necessary, with previous experience of power station electrical maintenance desirable. Previous applicants will be considered and need not re-apply. Salary: Class H, Grade 8, £1,165/£1,295 per annum.

Applications, quoting Vacancy No. to (or on form from) Personnel Officer, Central Electricity Generating Board, London Division, P.O. Box No. 136, London W.1, by 7 Feb., 1961. (T 405)

THE SOUTH WALES ELECTRICITY BOARD

PRINCIPAL ASSISTANT
(EXPENDITURE)

APPLICATIONS are invited for the position of Principal Assistant (Expenditure) in the Cardiff and East Central Area of the Board.

The person appointed will be required to take control of the Expenditure Section and therefore have experience of wages, stores accounting, costing and the provision of comprehensive management statistics. Applicants must be prepared to advise on improving systems used in the Department. The possession of a professional Accountancy qualification will be an advantage.

Salary: N.J.C. Grade 8 (£1,380/£1,500 per annum).

Applications stating age, present position, present salary, qualifications and experience should be addressed to C. L. Townsend, Assoc.I.E.E., Manager, Cardiff and East Central Area, 445/447 Cowbridge Rd East, Cardiff, to arrive not later than 11 Feb., 1961.

Envelopes should be endorsed "Principal Assistant (Expenditure)—6/61."

R. G. WILLIAMS,
Secretary,
(T 437)

CENTRAL ELECTRICITY GENERATING BOARD
North Eastern and Yorkshire Region

ASSISTANT ELECTRICAL ENGINEER

APPLICATIONS are invited for the position of Assistant Electrical Engineer in the Regional Research and Development Department, with Headquarters at Skelton Grange "B" Power Station, Leeds.

The research work of the section covers all electrical aspects of generation and transmission in the Region. Present projects concern novel methods of de-icing overhead conductors, methods of minimising radio interference and economic dispatching.

Candidates should have a university degree and at least two years' research experience.

Good promotion prospects exist within the Research Department of the Generating Board.

The salary scale for the appointment will be within the range of £1,105/£1,720 per annum, Grade 8-5, Class BX of the National Joint Board Agreement and will commence at a point commensurate with qualifications and experience.

Forms of application may be obtained from the Assistant Regional Secretary (Personnel), Central Electricity Generating Board, North Eastern and Yorkshire Region, 1 Whitehall Rd, Leeds 1, to whom they should be returned to arrive not later than 20 Feb., 1961. (T 349)

LONDON ELECTRICITY BOARD

APPLICATIONS are invited for the undernoted positions:

ENGINEERING DRAUGHTSMAN
(Ref.: PER/V/3186/T)

Surrey Suburban District, Durnsford Rd, Wimbledon, S.W.19.

Candidates should have a good general and technical education and be in possession of the Ordinary National Certificate, be neat and capable draughtsmen and be experienced in one or more of the following subjects: drawing office routine, electrical diagrams, layout of plant in transformer chambers, mains survey and recording of mains work.

The post is graded under Schedule A of the National Joint Board Agreement as Class H, Grade 13, £815/£920 per annum, inclusive of London Allowance.

DRAUGHTSMAN OR DRAUGHTSWOMAN
(Ref.: PER/V/3185/T)

Northern District, 18-24 Lower Clapton Rd, Clapton, E.5.

Applicants should have had previous drawing office experience preferably with a public utility authority. The successful candidate will be required to prepare drawings of mains layouts, system diagrams and permanent records.

The post is graded within the National Joint Council Agreement (Administrative and Clerical Grades) as Grade 2, i.e., £700/£775 per annum, plus the appropriate London Area Allowance.

Applications, in writing and quoting ref. no., should be addressed to the appropriate District Manager, within 14 days of the publication date of this notice. (T 401)

CENTRAL ELECTRICITY GENERATING BOARD
Midlands Project Group

THIRD ASSISTANT ENGINEER
(SITE PROGRESS)

APPLICATIONS are invited for the appointment of Third Assistant Engineer (Site Progress) at Aberthaw Power Station.

Candidates should preferably possess a Higher National Certificate in either mechanical or electrical engineering and have served a recognised engineering apprenticeship. Experience on the construction of heavy plant as installed in modern power stations either in a manufacturers' works or on site is essential and a knowledge of the civil engineering work involved would be an advantage.

The selected candidate will be required to maintain up-to-date charts on the progress of the works on site in accordance with previously agreed programmes and to assist the Resident Engineer in anticipating any divergence from these programmes. Ability to co-ordinate with Regional P.I.T. Officers will be required.

The salary will be within Grade 7, Scale 13 (£1,285/£1,610 per annum), of the National Joint Board Agreement.

Applications should be made on standard form AE6 available from the Administrative Officer, Midlands Project Group, P.O. Box 314, Birmingham 30, and should be returned to him not later than 6 Feb., 1961.

Envelopes should be marked "Confidential"—Staff Vacancy No. MPG.3/61.

(T 406)

LONDON ELECTRICITY BOARD

ENGINEER (METER)

APPLICATIONS are invited for the above position in the Meter and Test Branch of the Chief Engineer's Department at Effie Rd, Fulham, S.W.6.

Applicants should preferably hold the Higher National Certificate and should have up-to-date experience in the repair and testing of large quantities of meters and in the control of staff.

The post is graded under Schedule B of the National Joint Board Agreement as Grade 8, Class BX—salary range: £1,155/£1,460 per annum, inclusive of London Allowance.

Application form obtainable from the Personnel Officer, 46 New Broad St, E.C.2, to be returned completed within 14 days of the publication date of this notice. Please quote ref.: PER/V/3134/T. (T 407)

YORKSHIRE ELECTRICITY BOARD
No. 1 (Bradford) Sub-Area

THIRD ASSISTANT ENGINEER
(CONSTRUCTION)

APPLICANTS should be Corporate Members of the Institution of Electrical Engineers or hold other acceptable technical qualifications, and should have good experience in the construction of extensive complete overhead and underground H.V. systems, preferably including those operating at 33 kV.

Salary: N.J.B. Class L, Grade 10 (Scale 10), £1,190/£1,325 per annum.

Applications, together with the names of two referees, should be sent to the Manager, Yorkshire Electricity Board, No. 1 (Bradford) Sub-Area, 45-53 Sunbridge Rd, Bradford 1, not later than 3 Feb., 1961.

No. 4 (Leeds) Sub-Area

LEEDS DISTRICTS
(NORTH WEST, NORTH EAST AND SOUTH)
THIRD ASSISTANT DISTRICT ENGINEERS

Applicants should be graduates of the Institution of Electrical Engineers or hold equivalent qualifications. They should have suitable experience in the design, construction or operation and maintenance of urban distribution systems.

The successful candidates will be required to reside within the District and undertake standby duties.

Salary: N.J.B. Class G, Grade 9 (Scale 7), £965/£1,090 per annum.

Applications, together with the names of two referees, should be sent to the Manager, Yorkshire Electricity Board, No. 4 (Leeds) Sub-Area, Bramhope, Leeds, not later than 3 Feb., 1961. (T 374)

LONDON ELECTRICITY BOARD
Eastern District

APPLICATIONS are invited for the undernoted positions at 84 Romford Rd, Stratford, E.15.

ASSISTANT DISTRIBUTION ENGINEERS

Applicants should have a sound technical education to the standard of the Higher National Certificate and possess practical experience of engineering work associated with the organisation of a District distribution department.

The posts are graded under Schedule A of the National Joint Board Agreement as Class J, Grade 14, £815 per annum, rising to £920 per annum, inclusive of London Allowance.

GENERAL ASSISTANT ENGINEERS

Applicants should have a sound technical education to the standard of the Higher National Certificate, and have completed a recognised period of training in the Electricity Industry, or have equivalent experience.

Pending determination as to the grading and salary applicable to the posts within the National Joint Board Agreement, the provisional minimum salary will be £685 per annum rising to £855 per annum, inclusive of London Allowance.

Applications, in writing, should be sent to the District Manager at the above address. Please quote ref.: PER/V/3110/T. (T 447)

MERSEYSIDE AND NORTH WALES ELECTRICITY BOARD

SENIOR SERVICE CENTRE ASSISTANT

REQUIRED at Whitchurch. Salary within range £600/£700 per annum (N.J.C. Grade 1).

Applicants should have a sound knowledge of modern electrical appliances and of the electrical retail trade. Duties will include responsibility for the Service Centre, sales of appliances, advice to consumers, window display and receipt of accounts.

Appointment subject to medical examination. Pension Scheme.

Standard application forms obtainable from the Manager, No. 4 Sub-Area, Electricity Hse, Rhostyllen, nr. Wrexham, or from any District Office. Closing date: 6 Feb., 1961.

Previous applications remain under consideration. (T 441)

K & L STEELFOUNDERS AND ENGINEERS LIMITED

Letchworth . . . . . Hertfordshire

One of the 600 Group of Companies

ELECTRICAL ENGINEER

We wish to appoint a man to deal with a connected load of 25,000 kVA over a wide variety of plant and machinery.

Responsibility for all aspects of Electrical Engineering activity directly to the Works Engineer.

Applicants in the age range 25-35, should have had a sound practical training and possess a recognised qualification.

The position offers an excellent opportunity for gaining experience and advancement.

Starting salary not less than £1,100 per annum. Progressive staff conditions include Pension Scheme and some assistance can be offered with housing.

Applications, in confidence, giving a concise account of background and career to date should be addressed to the Personnel Director. (T 417)

CENTRAL ELECTRICITY GENERATING BOARD
South Western Division

ASSISTANT SHIFT CHARGE ENGINEER
Vacancy No. ET/AV/13/61.

REQUIRED at East Yelland Power Station.

Superannuation Scheme. Salary: N.J.B. Class H, Grade 9, Scale 8, £1,040/£1,165 per annum, plus 10% Shift Allowance.

Applicants should possess good technical qualifications and should have had training and experience in the Control and Operation of modern steam generating plant and main switchgear.

Applications on Form AE6/ACT, obtainable from the Divisional Secretary, 26 Oakfield Rd, Bristol 8, should be completed and returned by 8 Feb., 1961. (T 448)

MIDDLESEX COUNTY COUNCIL—EDUCATION DEPARTMENT

LABORATORY STEWARD

REQUIRED at Twickenham Technical College, Egerton Rd, Twickenham, Middx, for Electrical Machines and Power Laboratory which is equipped with comprehensive range of apparatus, including automatic control machines. Should have knowledge of electrical machines or power equipment and be able to use initiative in setting up and maintaining such equipment. Salary Misc. V, £685/£760 plus London Weighting of up to £40 Thirty-eight-hour week. Prescribed conditions. Write to Principal, above address, by 14 Feb.

(Quote F.353 E.T.)

(T 450)

CENTRAL ELECTRICITY GENERATING BOARD
South Eastern Division

KINGSTON POWER STATION
Vacancy No. 30/61.
ELECTRICAL MAINTENANCE ENGINEER

THE successful candidate will be responsible for the organisation and efficient working of the Electrical Maintenance Department in a high merit station.

Applicants should have had experience in the maintenance of heavy electrical plant and switchgear and should possess the H.N.C. in Electrical Engineering (Power). Experience in the control of labour is desirable.

The Station is pleasantly situated on the banks of the River Thames near to a good shopping centre. Good educational facilities are available in the area.

Salary: N.J.B. Class G, Grade 6, £1,240/£1,375 per annum including London Allowance.

Applications giving age, details of experience, qualifications, etc., and quoting vacancy number should be sent to the Station Superintendent, Kingston Power Station, Down Hall Rd, Kingston upon Thames, Surrey, to arrive by 6 Feb., 1961. (T 444)

YORKSHIRE ELECTRICITY BOARD
Head Office
Commercial Department

SENIOR ASSISTANT ENGINEER
(TARIFFS AND STATISTICS)

A VACANCY exists for a statistician to take charge of the Statistics Section of the Commercial Department at Head Office. Applicants should possess a qualification in statistics or mathematics and have had practical experience in statistical work. The work involves responsibility for the collection and collation of statistics, for sampling surveys and for the interpretation and assessment of results. Candidates must have a working knowledge of statistical techniques and particularly of correlation analysis.

Salary: N.J.B. Class BX, Grade 2, within the range £1,695/£2,085 per annum.

PRINCIPAL ASSISTANT (PERSONNEL)

The successful applicant will be required to assist in matters of employment and labour relations in the Personnel Section of the Secretary's Department at Head Office.

Candidates should have a sound experience of recruitment and selection procedure, personnel records and statistics and manpower establishments. A detailed knowledge of the wage and salary agreements and an appreciation of the negotiating machinery is essential.

An appropriate professional qualification would be an advantage.

Salary: N.J.C. Grade 7, £1,250 x £35—£1,355 per annum.

Applications, with the names of two referees, should be sent to the Secretary, Yorkshire Electricity Board, Wetherby Rd, Scarcroft, Leeds, not later than 6 Feb., 1961.

No. 6 (Hull) Sub-Area

THIRD ASSISTANT ENGINEER
(CONSTRUCTION)

Applicants should have had experience in primary substation and system construction work with particular reference to cable work at all voltages. The successful applicant will be required to assist in the supervision of the construction of primary substations generally and to investigate cabling problems throughout the Sub-Area.

Possession of technical qualifications to the minimum of the Graduateship of the Institution of Electrical Engineers is essential

Salary: N.J.B. Class L, Grade 10 (Scale 10), £1,190/£1,325 per annum.

Applications, with the names of two referees, should be sent to the Manager, No. 6 (Hull) Sub-Area, Yorkshire Electricity Board, Ferensway, Hull, not later than 10 Feb., 1961.

No. 3 (Sheffield) Sub-Area

SHEFFIELD WEST DISTRICT
THIRD ASSISTANT DISTRICT ENGINEER

Applicants should possess a Higher National Certificate in Electrical Engineering or equivalent qualifications, and have had experience in the work of a District Engineering Department.

Salary: N.J.B. Class J, Grade 9 (Scale 9), £1,115/£1,245 per annum.

Applications, with the names of two referees, should be sent to the Manager, No. 3 (Sheffield) Sub-Area, Yorkshire Electricity Board, Commercial St, Sheffield, not later than 10 Feb., 1961. (T 449)

SOUTHERN ELECTRICITY BOARD

PLANNING ENGINEER

PORTSMOUTH District of No. 3 (Portsmouth) Sub-Area. Salary: N.J.B. Class J, Grade 6 (£1,350/£1,500 per annum). N.J.B. Conditions of Service.

The duties of the post will include the preparation of schemes and estimates for extensions and/or reinforcements to overhead and underground networks up to and including 33kV. The appointment will involve standby duties.

The successful applicant will be required to contribute to the Electricity Supply (Staff) Superannuation Scheme, if eligible.

Applications on forms obtainable from the Sub-Area Secretary, Lower Drayton La, Cosham, Portsmouth, and returned to him, quoting Z.1305, not later than 6 Feb., 1961. (T 446)

EASTERN ELECTRICITY BOARD

APPLICATIONS are invited for the following appointments. The successful candidates will be required to contribute to a superannuation scheme and may be required to undergo a medical examination.

THIRD ASSISTANT ENGINEERS

(a) Southend District—Essex Sub-Area. 9/61.R.
(b) North Essex District—Essex Sub-Area. 10/61.R.
(c) Stevenage District—Northmet Sub-Area. 12/61.R.

Candidates should have had a sound technical training and suitable experience in the construction, operation and maintenance of H.V. and L.V. overhead and underground distribution systems, including substations.

Salary:
(a) N.J.B. Class H, Grade 9 (£1,040/£1,165).
(b) N.J.B. Class F, Grade 9 (£890/£1,015).
(c) N.J.B. Class G, Grade 9 (£965/£1,090).

Apply by letter by 10 Feb., 1961, to:
(a) J. Linton, A.H.W.C., M.I.E.E., A.I.MECH.E., Manager, Southend District, Eastern Electricity Board, 85 London Rd, Southend-on-Sea, Essex.
(b) J. C. Horrell, M.I.E.E., Manager, North Essex District, Eastern Electricity Board, Cressing Rd, Braintree, Essex.
(c) H. L. Sumner, Manager, Stevenage District, Eastern Electricity Board, Walkern Rd, Stevenage, Herts.

Suffolk Sub-Area

DEMONSTRATOR
BURY ST. EDMUNDS DISTRICT
11/61.R.

Candidates should have had domestic science training including electrical housecraft; should preferably hold the E.A.W. Certificate and be competent to plan and give cookery demonstrations including lectures and advice to consumers on the utilisation of domestic electrical apparatus.

Salary: N.J.C. Grade 1 (£600/£700).

Apply by letter to H. B. Rendle, A.M.I.E.E., Manager, Bury St. Edmunds District, Eastern Electricity Board, 4 Cornhill, Bury St. Edmunds, Suffolk, by 20 Feb., 1961. (T 451)

CENTRAL ELECTRICITY GENERATING BOARD
Southern Division

FOURTH ASSISTANT ENGINEERS

TECHNICAL DEPARTMENT

APPLICATIONS are invited for the above appointments in the Reading and Melksham areas.

Duties will include the installation and maintenance of automatic telephone type equipment, including applications in telephony, supervisory and remote control system. Knowledge of V.F. line signalling technique and an acquaintance with electronic or V.H.F. radio would be an advantage.

Applicants should preferably possess an appropriate Higher National Certificate or equivalent qualifications.

Salary: N.J.B. Grade AX.11, £855/£1,090.

Special application forms (not AE6/ACT) obtainable only from Divisional Secretary, 111 High St, Portsmouth, should be returned by Wednesday, 8 March, 1961. (T 420)

MERSEYSIDE AND NORTH WALES ELECTRICITY BOARD

ASSISTANT SECTION ENGINEER

REQUIRED in the Chester District. Salary within range £1,040/£1,165 per annum (N.J.B. H.9).

Applicants should have had experience in the construction and operation of overhead and underground distribution systems up to 33 kV, including indoor and outdoor substation equipment, and be in possession of appropriate technical qualifications.

Appointment subject to medical examination. Pension Scheme.

Applications, on forms obtainable from the Manager, No. 3 Sub-Area, Electricity Hse, Newgate St, Chester, must be forwarded not later than 6 Feb., 1961. (T 440)

CENTRAL ELECTRICITY GENERTING BOARD
East Midlands Division

GENERAL ASSISTANT ENGINEER
(CHEMIST)
HIGH MARNHAM POWER STATION
Vacancy No. 5/61.

APPLICATIONS are invited for the position of General Assistant Engineer (Chemist) at High Marnham Power Station, near Newark, Notts.

Candidates should possess the Ordinary National Certificate in Chemistry as a minimum qualification, and should have previous experience in the analysis and testing of coal, water and oil, preferably in a power station laboratory.

The salary will be within the range £625/£805 per annum of the National Joint Board Agreement.

Closing date for receipt of applications: 3 Feb., 1961.

ASSISTANT MAINTENANCE ENGINEER
(ELECTRICAL)
HIGH MARNHAM POWER STATION
Vacancy No. 6/61.

Applications are invited for the position of Assistant Maintenance Engineer (Electrical) at High Marnham Power Station, near Newark, Notts.

Applicants should have received a sound training in Electrical Engineering.

Previous experience in Electrical Maintenance, and a knowledge of Planning Procedure is desirable.

Salary will be in accordance with Class M, Grade 8 (£1,440/£1,610 per annum) of the National Joint Board Agreement.

Closing date for receipt of applications: 3 Feb., 1961.

PLANT SHIFT CONTROL ENGINEER
DRAKELOW "B" POWER STATION
Vacancy No. 12/61.

Applications are invited for the position of Plant Shift Control Engineer at Drakelow "B" Power Station, near Burton on Trent, Staffs.

Experience desirable in control of Boilers and Turbines at high pressure and temperature, pulverised fuel togther with electrical control room experience.

Technical qualifications to Higher National Standard desirable.

Salary will be in accordance with Class L, Grade 10 (£1,190/£1,325 per annum) of the National Joint Board Agreement, plus 10% allowance for shift duties.

Closing date for receipt of applications: 10 Feb., 1961.

This appointment will be pensionable within the terms and conditions of the Electricity Supply (Staff) Superannuation Scheme.

Applications should be submitted on the official form, AE6/ACT, which may be obtained from the Station Superintendent, and should be returned to him not later than the date stated.

O. S. WOODS,
Divisional Controller.
(T 443)

GPO

A FIRST-CLASS JOB IN THE G.P.O.

Men between the ages of 20—35 are required to work in Central London on installing and maintaining telephone apparatus and transmission equipment. Older men, up to the age of 45, will be accepted if they have the experience which is particularly suitable.

Commencing pay is £9 16s per week rising to £12 2s.

Men who show ability to progress will be given every opportunity to qualify for Technical Officer posts on which the salary is £600 a year rising to £850. Further promotion is available.

Apply in writing stating age and experience to:

Chief Regional Engineer
(Ref. S/D2A(X2)),
London Telecommunications Region,
Waterloo Bridge House,
Waterloo Road,
London, S.E.1. (T 14)

RTB

RICHARD THOMAS & BALDWINS LIMITED
Spencer Works

Vacancies exist for

ELECTRICAL DRAUGHTSMEN

in the Electrical Engineers' Department at Spencer Works, now under construction at Llanwern, near Newport, Mon.

Applications are invited for these positions to assist in the design, development, and layout of plant and installations associated with the manufacture of iron, steel and finished products. Candidates, who should be between the ages of 21 and 45, will be responsible to the Chief Electrical Draughtsman. Preference will be given to those candidates with Ordinary National Certificate in electrical engineering.

The range of specialisation is not rigid, but applicants should be trained and experienced in development and layout work associated with steelworks, rolling mills, and finishing departments of modern composite plants, or comparable installations in medium or heavy industrial engineering.

Application forms, which should be returned by 3 Feb., 1961, can be obtained from:

The Manager,
Staff and Labour Relations Department,
Richard Thomas & Baldwins Limited,
Spencer Works, Llanwern,
Nr. Newport, Mon.

Please quote reference 839/A in your original letter of application.

(T 419)

ENFIELD–STANDARD POWER CABLES LTD.

Require urgently the following Staff.

1. ACCOUNTS CLERKS
2. NATIONAL MACHINE OPERATOR
3. ASSISTANT CHEMIST AT H.N.C. LEVEL
4. JUNIOR CHEMIST AT O.N.C. LEVEL
5. JUNIOR COPY TYPISTS (SOME EXPERIENCE)

and

YOUNG ELECTRICAL ENGINEERS FOR INSTALLATION CONTRACTS THROUGHOUT THE U.K.
(H.N.C. OR H.N.D. PREFERRED)

Apply Personnel Manager, Enfield-Standard Power Cables Ltd., Millmarsh La, Brimsdown, Mddx.

(T 430)

KLIPPON ELECTRICALS LIMITED
Sales Engineer for Birmingham Area

An opportunity exists for you to take up an interesting and rewarding career of selling with a progressive manufacturing company.

Applicants should have an electro-technical background and preferably some experience in selling.

Applications giving full details should be addressed to:

W. Fox, Esq.,
Klippon Electricals Ltd.,
Norfolk Hse,
28 Norfolk St,
Strand,
London W.C.2.

(T 454)

FORD

AN ELECTRICAL ESTIMATOR
is required by our Purchasing Staff as a Technical Assistant

Applicants must be able to evaluate tenders for all classes of industrial electrical installation, negotiate contractors' prices from tender to final account and have a general knowledge of contract document procedure.

Applications quoting age, training and experience should be addressed to:

MR V. W. WILLIAMS
TRAINING AND RECRUITMENT DEPARTMENT
FORD MOTOR COMPANY LIMITED · DAGENHAM · ESSEX

(T 457)

AEI

Associated Electrical Industries Limited

HIGH VOLTAGE DIELECTRIC PHENOMENA

Engineers with leanings towards physics or Physicists with engineering bent required to contribute to the knowledge of mechanisms of failure of insulation in service by developing new techniques of measurement of dielectric properties.

This is a relatively unexplored field in which enthusiasm for research work is more important than previous experience.

Please write quoting reference E.18 to:

Personnel Manager,
Associated Electrical Industries (Manchester) Ltd.,
Trafford Park,
Manchester 17

(T 432)

ELECTRICAL MAINTENANCE SUPERVISORS

are required by TEXACO TRINIDAD, INC.
for service in TRINIDAD

Applicants, who should be keen to make a career in the oil industry in the West Indies, must be between 26 and 35 years of age and have the following qualifications and experience:

Ordinary National Certificate in Electrical Engineering, a full apprenticeship, ability to drive and knowledge of the electrical maintenance and installation of industrial flameproof motors, manual and automatic starters, electrical tools, welding equipment, substation switchgear up to 6·6 kV and conduit installation practice.

They must also be able and prepared to organise and train labour and, if necessary, carry out some of the work themselves. Starting salary will be in the region of £1,400 p.a.

Texaco Trinidad, Inc. provides cheap married and single accommodation, excellent clubs and facilities for sport, schooling for children, comprehensive medical arrangements and a pension scheme.

Write with brief particulars only in the first instance to:
The Personnel Officer, TRINOIL (U.K.) LIMITED,
29/30 Old Burlington Street, London, W.1

(T 433)

MIDLANDS ELECTRICITY BOARD

APPLICATIONS are invited for the following superannuable posts:

Central Gloucestershire Sub-Area

DEMONSTRATOR (FEMALE) (DEAN FOREST)

Applicants must have had a good education and should have a Certificate of a recognised Domestic Training College and/or the E.A.W. Certificate. Some selling experience would be an advantage. Duties include lecture demonstrations in Service Centres and on consumers' premises and advice to consumers on the selection and use of electrical apparatus. Applicants must be prepared to take an active part in the sales organisation. Salary: £600/700 per annum (N.J.C. Grade 1). Apply, by letter, stating age, education, qualifications, training and experience, to Mr S. Rayboud, Sub-Area Manager, Midlands Electricity Board, Eastern Ave, Gloucester.

Shropshire & Herefordshire Sub-Area

SECOND ASSISTANT DISTRICT ENGINEER (SHREWSBURY)

Duties include the construction, operation and maintenance of H.V. and L.V. underground mains and overhead lines and substations, up to and including 33 kV, and the planning of system reinforcements and mains extensions. Technical qualifications desirable. Salary: £965/£1,090 per annum (N.J.B. Grade E.7). (It is expected that the classification will shortly be raised to F.) Apply, by letter, to Mr W. Winwood, Sub-Area Manager, Midlands Electricity Board, Spring Gardens, Ditherington, Shrewsbury.

South Staffs & North Worcs. Sub-Area

SECOND ASSISTANT DISTRICT ENGINEER (STOURBRIDGE)

Applicants should have had experience in all branches of district work, including the installation, operation and maintenance of high and low voltage cables, switchgear and transformers. Technical qualifications desirable. Salary: £1,040/£1,165 per annum (N.J.B. Grade F.7). Apply, by letter, within 14 days, stating age, qualifications, experience, present position and salary, to Mr H. A. P. Caddell (Ref. EMI/SEC), Sub-Area Manager, Midlands Electricity Board, P.O. Box No. 9, Toll End Rd, Tipton, Staffs.

F. W. CATER,
Secretary.
(T 422)

THE SOUTH WALES ELECTRICITY BOARD

GENERAL ASSISTANT ENGINEER

APPLICATIONS are invited for the position of General Assistant Engineer in the Swansea District of the Swansea and West Central Area.

Preference will be given to Engineers possessing the Higher National Certificate in Electrical Engineering.

Salary: N.J.B. Class G, Grade 9, Scale 7 (£965/£1,090 per annum).

Applications stating age, present position, present salary, qualifications and experience should be addressed to G. R. T. Edwards, B.SC., M.I.E.E., M.AM.I.E.E., Manager, Swansea and West Central Area, 29 Ystrad Rd, Swansea Industrial Estate, Swansea, to arrive not later than 11 Feb., 1961. Please quote reference 4/61/ET" endorsing envelope "General Assistant Engineer."

R. G. WILLIAMS,
Secretary.
(T 435)

AEI

Associated Electrical Industries Limited

INSULATION DEVELOPMENT

GRADUATE ELECTRICAL ENGINEER required for interesting work on the development of insulation systems for rotating machines. The work involves the evaluation of insulation materials and systems using model systems such as motorettes, and there is scope for initiative in developing new testing techniques. Some previous experience in this field would obviously be an advantage but it is not essential; enthusiasm would be equally acceptable.

Please write for application form quoting reference G.18 to:

Personnel Manager,
Associated Electrical Industries (Manchester) Ltd.,
Trafford Park,
Manchester 17

(T 431)

TRANSFORMER TEST ENGINEER

to take charge of test department of small rapidly growing company making transformers up to 1,000 kVA. Good salary and excellent prospects for the right man. Some assistance with housing would be given if needed.

TRANSFORMERS & RECTIFIERS LTD.
Millmead, Guildford, Surrey
(T 421)

A.C. MOTOR DESIGNER/DRAUGHTSMAN

up to or approaching H.N.C. standard, age 20-25 years, to work with Senior Designer on complete design problems, electrical and mechanical, associated with orthodox and special induction motors.

YOUNG DESIGNER/DRAUGHTSMAN

up to or approaching H.N.C. standard, and with good all-round electrical engineering adaptability, for interesting work under Senior Designer on motor control gear and associated equipment embracing the use of modern light current and electronic components.

Write giving details of age, experience and technical background to the Secretary, British Jeffrey-Diamond Ltd., Wakefield. (T 410)

SANGAMO WESTON

Vacancies occur for young men who hold the B.Sc. or Higher National Certificate in

ELECTRICAL ENGINEERING

The posts are concerned with:—

(a) The DEVELOPMENT AND APPLICATION of electro-mechanical devices in the field of electrical measurement. Applicants should preferably have experience in electrical engineering laboratory techniques and in the manipulation of fine mechanisms.

(b) The PREPARATION OF SPECIFICATIONS of electrical measuring instruments to meet customers' requirements and liaison between Development Laboratories and Contracts Department.

The organisation is progressive and expanding. A contributory Superannuation Fund and Endowment Scheme is in operation, together with the normal sports, social and welfare facilities.

Salaries will be commensurate with qualifications and experience.

★ Please apply in first instance by letter, stating age, outlining previous experience, and indicating when available, to the Personnel Manager.

SANGAMO WESTON LIMITED

Cambridge Road
Enfield
Middlesex

(T 409)

CENTRAL ELECTRICITY GENERATING BOARD
Eastern Division

APPLICATIONS are invited for the following appointments in the System Operation Department, Thames North Grid Control Centre, Redbourn, near St. Albans, Herts.

(a) THIRD ASSISTANT ENGINEERS
(S.V. No. 1397)

Salary: N.J.B., Class BX, Grade 8, Scale 11, £1,105/£1,410 per annum, plus 10% Shift Allowance.

(b) FOURTH ASSISTANT ENGINEERS
(S.V. No. 1398)

Salary: N.J.B., Class BX, Grade 9/11, within the range of Scales 8-10, £855/£1,325 per annum.

The commencing salaries will be within the above ranges at points commensurate with qualifications and experience. The minimum technical qualification required is the Higher National Certificate in Electrical Engineering.

Some generating station and/or transmission/technical experience is essential in the case of appointment (a) and is desirable for appointment (b). The successful applicant in the case of appointment (a) will be required to undertake shift duties in the Grid Control Room. In the case of appointment (b) the duties are on day work and are of a general technical and statistical nature, but applicants must be prepared ultimately to undertake shift duties in the Grid Control Room.

Forms of Application (AE.6/ACT) may be obtained from the Board's Headquarters, or from any Divisional Offices of the Board, and should be addressed to the Controller, Central Electricity Generating Board, Eastern Division, West Farm Pl, Chalk La, Cockfosters, Barnet, Herts, to arrive not later than 11 Feb., 1961, quoting the appropriate reference S.V. No. (T 416)

SOUTH EASTERN ELECTRICITY BOARD

FIRST ASSISTANT DISTRICT COMMERCIAL ENGINEER
TWICKENHAM AND RICHMOND DISTRICT

SALARY scale at present N.J.B. Class F, Grade 5, £1,190/£1,325 per annum, plus London Allowance, with progression to Grade 4 (maximum salary £1,410) subject to satisfactory service. (Reclassification to Glass G anticipated in 1961.)

Successful candidate will be responsible to the District Commercial Engineer, and will be required to assist with tariff negotiations, sales activities, contracting, public lighting and general load development. Applicants must have suitable experience, and should preferably possess a Higher National Certificate in Electrical Engineering or its equivalent. Consideration will be given to a private car allowance. Applications, quoting ET, on forms from District Manager, Seeboard, 42 York St, Twickenham, Middx, by 8 Feb., 1961.

ASSISTANT DISTRICT COMMERCIAL ENGINEER (CONTRACTING)
TUNBRIDGE WELLS DISTRICT

Salary: £825/£940 per annum, under N.J.B. Class F, Grade 10. Superannuable. The candidate appointed will be an assistant to the engineer responsible for electrical installation contracting work in the district, and his duties will include the preparation of estimates and schemes for contracting work. Possession of the H.N.C. in electrical engineering would be an advantage. Applications, quoting ET, and naming two referees, to District Manager, Seeboard, Town Hall, Tunbridge Wells, by 6 Feb., 1961.

SHOWROOM SUPERVISOR
THANET DISTRICT

Salary: £780 p.a. x £25—£880 p.a., under N.J.C. Grade 3. Superannuable. Applicants should have an extensive knowledge of showroom procedure, display techniques, sales promotion, stock control, the application of tariffs, and be experienced in the supervision of sales staff. Possession of the E.D.A. salesmanship qualifications is essential. The successful candidate may elect to have a service tenancy of a Board flat. The successful applicant will normally be re-

continued in next column

continued from previous column

quired to do duty in the Margate showroom, but he may be called to work elsewhere within the Thanet district. Applications, quoting ET, and naming two referees, to District Manager, Seeboard, Electricity Offices, St. Peter's, Broadstairs, Kent, by 8 Feb., 1961.

GEORGE WRAY,
Secretary.
(T 438)

MERSEYSIDE AND NORTH WALES ELECTRICITY BOARD

SECOND ASSISTANT ENGINEER (PLANNING)
POST A
and
THIRD ASSISTANT ENGINEER (TECHNICAL)
POST B

REQUIRED in the Chief Engineer's Department at Board Headquarters, Love La, Pall Mall, Liverpool 3. Commencing salary at a suitable point within the range:

POST A: £1,375/£1,610 per annum (N.J.B. AX/5)

POST B: £1,105/£1,325 per annum (N.J.B. AX/8)

It is anticipated that the Board's classification will be increased to BX in the near future, when the appropriate salary will be within the range:

POST A: £1,375/£1,720 per annum.
POST B: £1,105/£1,410 per annum.

Applicants for POST A should have a good knowledge of distribution systems at all voltages, and a good understanding of the associated economic factors.

Applicants for POST B should have good experience in the use of instruments and recorders, knowledge of telephone equipment and the planning and operation of communication systems, including V.H.F. radio. The successful applicant will be required to undertake special investigations in the field of Communication and Measurement.

In both posts, technical qualifications are desirable.

Appointments subject to medical examination. Pension Scheme.

Applications for either post should be made on forms obtainable from the Establishments Officer at the above address. Closing date: 10 Feb., 1961. (T 427)

NORTH OF SCOTLAND HYDRO-ELECTRIC BOARD
North Caledonia Area

SECOND ASSISTANT ENGINEER
(PLANNING AND PROTECTION)

APPLICATIONS are invited for the above superannuable post at Area Office, Elgin, Morayshire. Experience required in the planning of urban and rural distribution networks, and the design of substations at voltages up to and including 33 kV. Candidates should preferably be Corporate Members of the Institution of Electrical Engineers or have qualifications leading to this. Salary and Conditions of Service in accordance with N.J.B. H.6 or H.7, £1,275/£1,410, or £1,190/£1,325 per annum, according to experience.

Application Form obtainable from the Area Manager, West Villa, South St, Elgin, should be returned by 13 Feb., 1961.

(T 442)

SUPERVISING ENGINEERS

SUPERVISING Engineers both Electrical and Mechanical are required by the War Department throughout the South of England. Candidates must have a sound engineering background with experience in the maintenance of electrical and/or mechanical installations.

Minimum technical qualifications required are Ordinary National Certificate (E. or M.) or equivalent.

Starting pay (on a scale of £770/£950) is based on age, qualifications and experience.

Prospects of establishment and promotion. Normal week 42 hours (net).

Apply stating age and full details of training and experience to: Command Works Officer, HQ, Southern Command, Wilton, Salisbury, Wilts, from whom further information may also be obtained. (T 424)

THE NORTH WESTERN ELECTRICITY BOARD

GENERAL ASSISTANT ENGINEER
TELECOMMUNICATIONS SECTION
SUB-AREA ENGINEERING DEPARTMENT
MANCHESTER

THE duties will include assisting in the commissioning and maintenance of Sub-Area Supervisory Control and automatic telephone equipments, and an adequate technical training, together with practical experience of telephone installations, is required.

Salary Scale: £765/£870 p.a., Grade M.17. N.J.B. Conditions.

FOURTH ASSISTANT DISTRICT COMMERCIAL ENGINEER
(TECHNICAL SALES AND SERVICE)
EAST DISTRICT
CHORLTON-ON-MEDLOCK
MANCHESTER

Applicants should be capable of assisting the Technical Sales and Service Engineer in connection with Industrial and Commercial matters. Good technical training essential.

Salary Scale: £765/£870 p.a., Grade H.13. N.J.B. Conditions.

Applications on forms to be obtained from the Manager (Staff Vacancy), No. 1 Sub-Area, the North Western Electricity Board, Town Hall, Manchester, P.O. Box 493, and returned to him by 6 Feb., 1961. (T 439)

APPLICATIONS are invited for SALES REPRESENTATIVE by well established company specialising in DOMESTIC AND DECORATIVE LIGHTING. Appointment will be on salary and commission for position of permanence and responsibility. Reply full details of education, qualifications and experience in own handwriting.—Box No. 8137, Electrical Times. (T 456)

CROMPTON PARKINSON (CHELMSFORD) LTD. invite applications for appointments in the Machine Department, Estimating Section, at their Chelmsford Works. Applicants should have had a sound technical training and some experience in handling inquiries for A.C. and D.C. rotating plant and control gear up to 1,500 h.p./kW capacity. Congenial working conditions with excellent opportunities for advancement. Five-day week. Superannuation Scheme. Apply in confidence stating age, whether married or single, with details of experience and training to Personnel Officer, Crompton Parkinson (Chelmsford) Ltd., Chelmsford. (T 280)

CABLING JOINTER wanted, capable of jointing up to and including 11 kV and also, if necessary, to work on live cables. Must be willing to travel anywhere in the Midlands, Lincolnshire and Lancashire areas. Must be able to drive. Good rates of pay and working conditions.—Box No. 8155, Electrical Times. (T 412)

DRAUGHTSMAN for High Voltage Substation work. Experience on protective and control gear wiring diagrams essential. The person appointed would have the opportunity to train in technical and contract engineering work on wide range of electrical equipment. Applications in writing to: Managing Director, Cruickshank and Partners Ltd., 100 Renfrew St, Glasgow C.2. (T 453)

ELECTRICAL ENGINEER required by Consulting Engineers, Piccadilly, age about 30. HNC and some years' experience of heavy equipment essential. Comm., sal. and bonus about £1,100. Pensionable post. Reply with full details to Box F. 172, c/o Streets, 110 Old Broad St, E.C.2. (T 455)

ELECTRIC CONTROL GEAR ENGINEER/DRAUGHTSMAN, experienced in Circuitry for Heating, Ventilating and Oil Burner Controls required by Consulting Engineers. Candidates should have at least a Higher National Certificate or Grad.I.E.E. Apply stating qualifications and experience to Kennedy and Donkin, 12 Caxton St, S.W.1. Ref.: FBT/WBH. (T 297)

Box No. replies to be addressed to the ELECTRICAL TIMES, Sardinia House, Sardinia Street, London, W.C.2

INDEX TO ADVERTISERS

Alberice Meter Co. 56
Ashley Accessories Ltd. 23
Associated Electrical Industries Ltd. (Cable Division) ... ... *Cover* (i)
Associated Electrical Industries Ltd. (Motor and Control Gear Division) 13
Associated Electrical Industries Ltd. (Transformer Division) 44
Avo Ltd. 30

British Driver-Harris Co. Ltd. ... 10
British Electrical Repairs Ltd. ... *Cover* (iii)
British Insulated Callender's Cables Ltd. 53
Brookhirst Igranic Ltd. 9
Brush Electrical Engineering Co. Ltd.... 5

Central Electricity Generating Board... 20
Crompton Parkinson Ltd. ... 14, 55

Dahl Brothers Ltd. 56
Dorman & Smith Ltd. 28

East London Mica Works 6
Electrical Times Ltd. 57
Electric Construction Co. Ltd.... ... 27
Electro-Mechanical Mfg. Co. Ltd. ... 37
Ellison, George Ltd. 33
Erma Ltd. 17
Evershed & Vignoles Ltd. 35

Ferranti Ltd. 42

Gaskell & Grocott Ltd. 56
General Electric Co. Ltd. ... 11, 25
Granville Engineering Co. Ltd. ... 36
Griffiths, Gilbart, Lloyd & Co. Ltd. ... 54

Hackbridge & Hewittic Electric Co. Ltd. 43
Harvey, G. A. & Co. (London) Ltd. ... 19
Holophane Ltd. ... ... *Cover* (ii)

Imhof, Alfred Ltd. 3
International Synthetic Rubber Co. Ltd. 24
Irish Cables Ltd. 29

Kempston Electrical Co. Ltd. 32

Lockers, Thomas (Metal Perforators) Ltd. 32

M.C.B. Co. (Manchester) Ltd. 54
Metway Electrical Industries Ltd. ... 18
Midland Electric Manufacturing Co. Ltd. 40
M.K. Electric Ltd. 16

Nalder Bros. & Thompson Ltd. ... 8

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Salter, Geo. & Co. Ltd. 38
Siemens Schuckert (Gt. Britain) Ltd.... 56
Simmonds & Stokes (Niphan) Ltd. ... 54
Simplex Electric Co. Ltd. ... 12, 26
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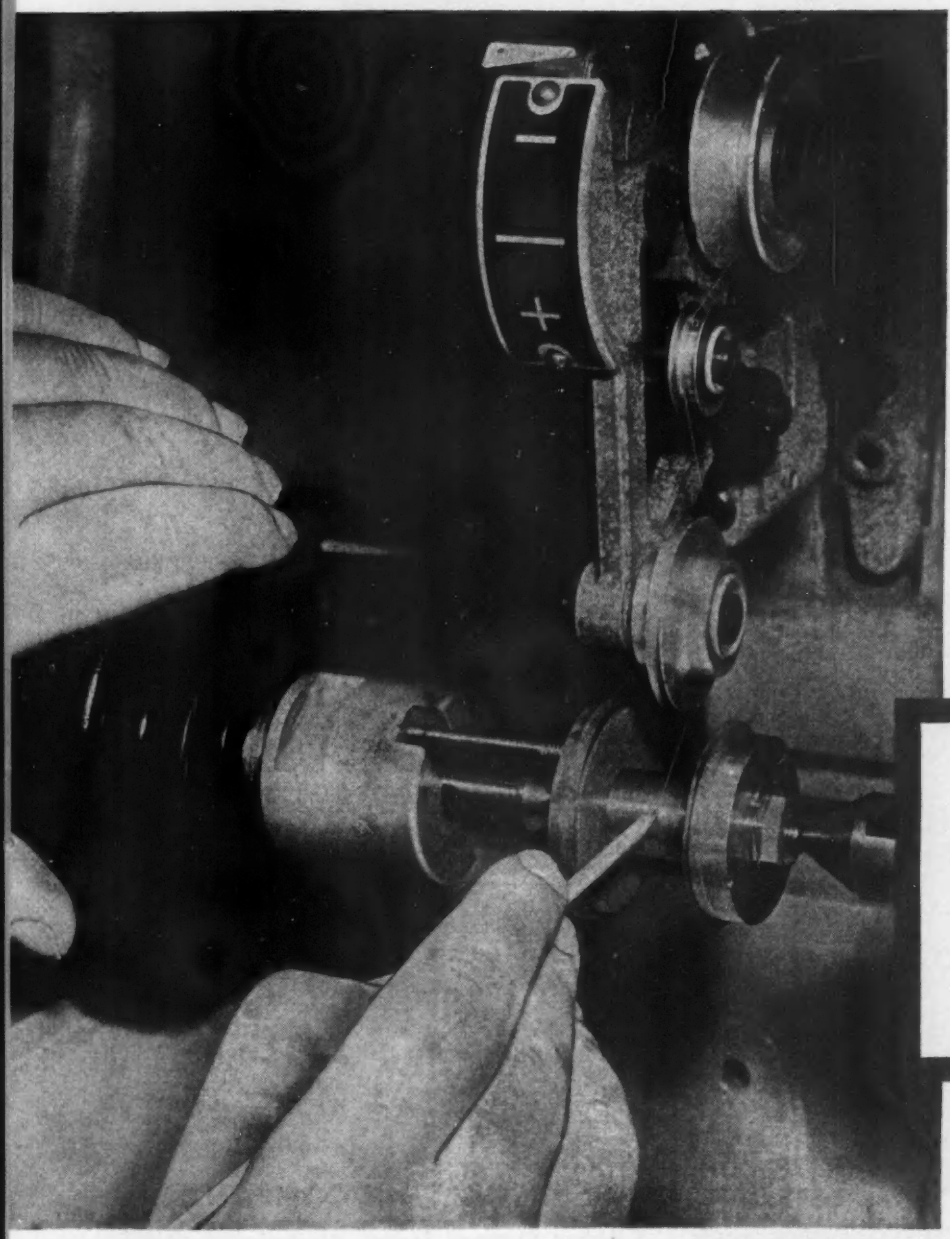

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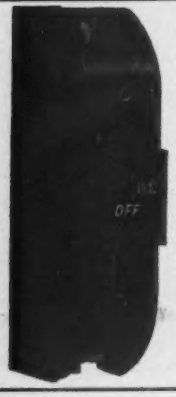

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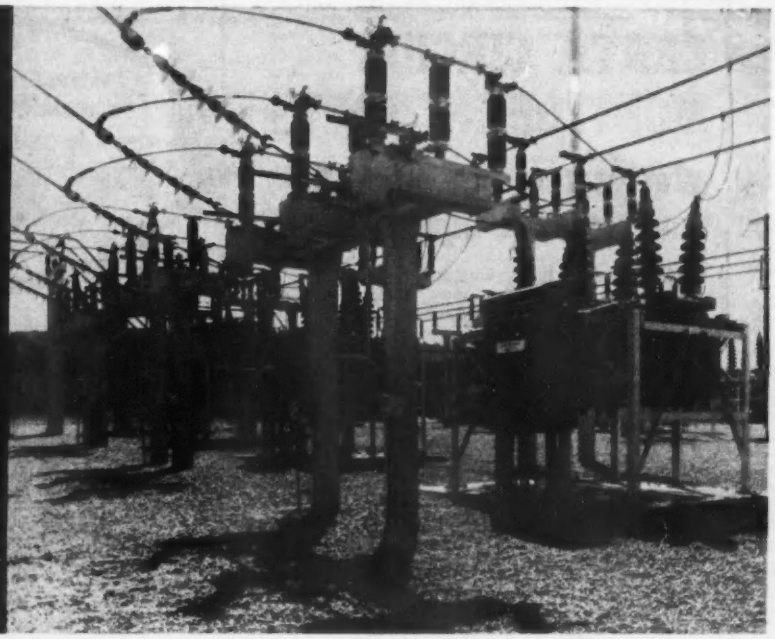

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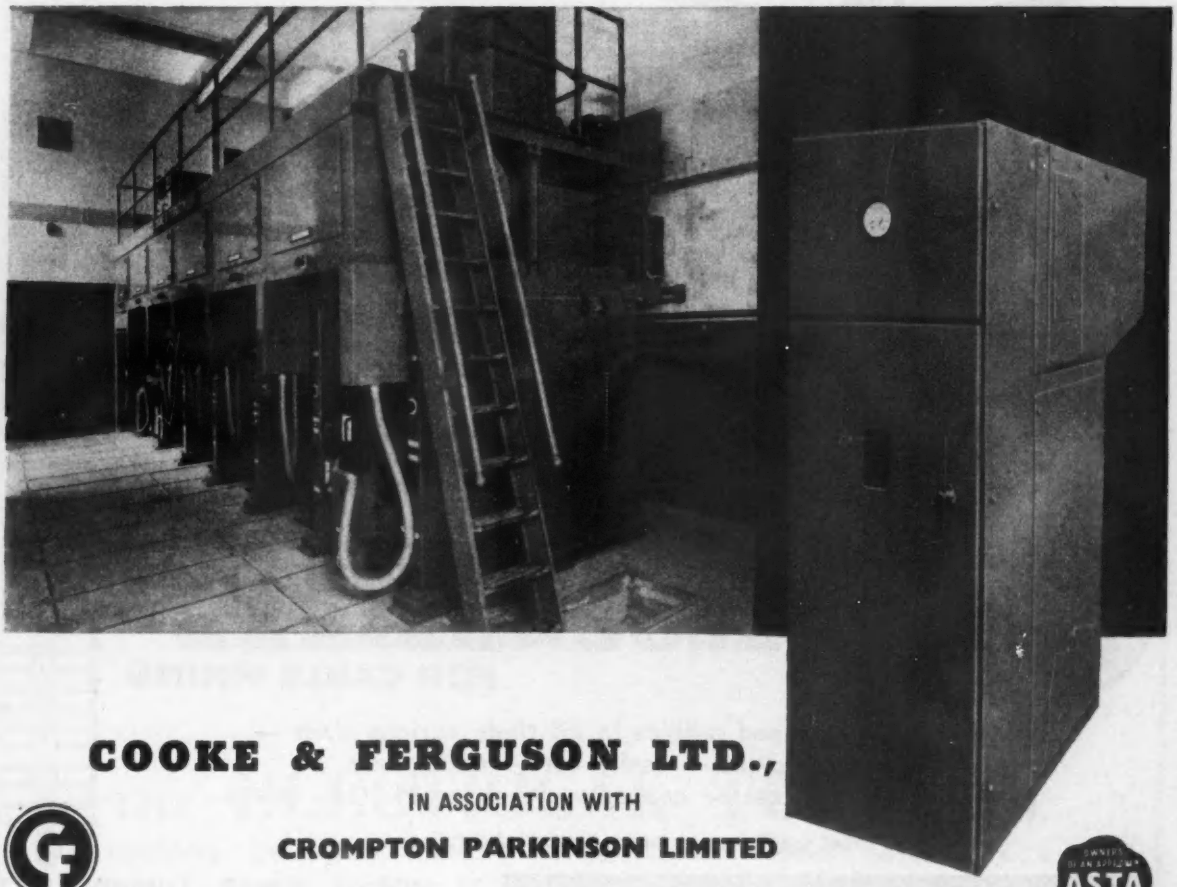

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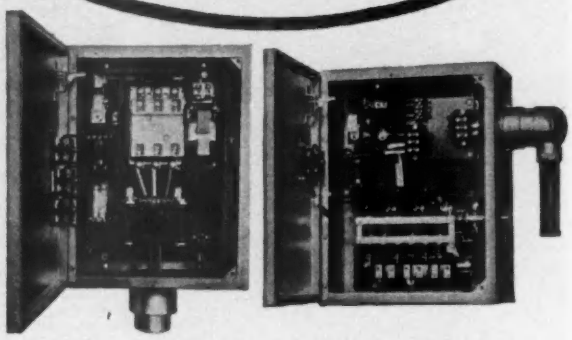

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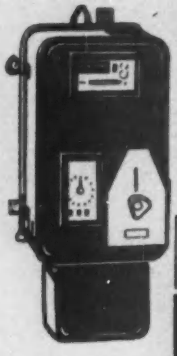

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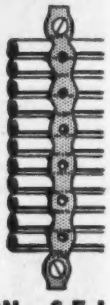

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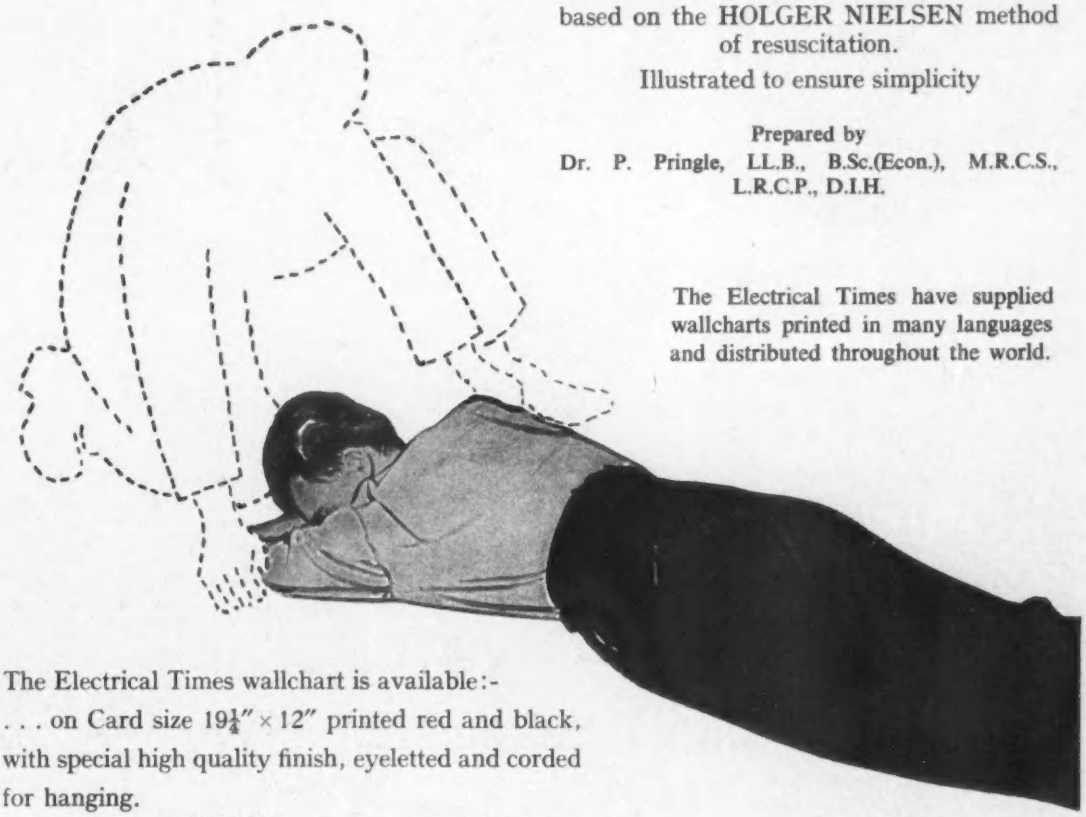

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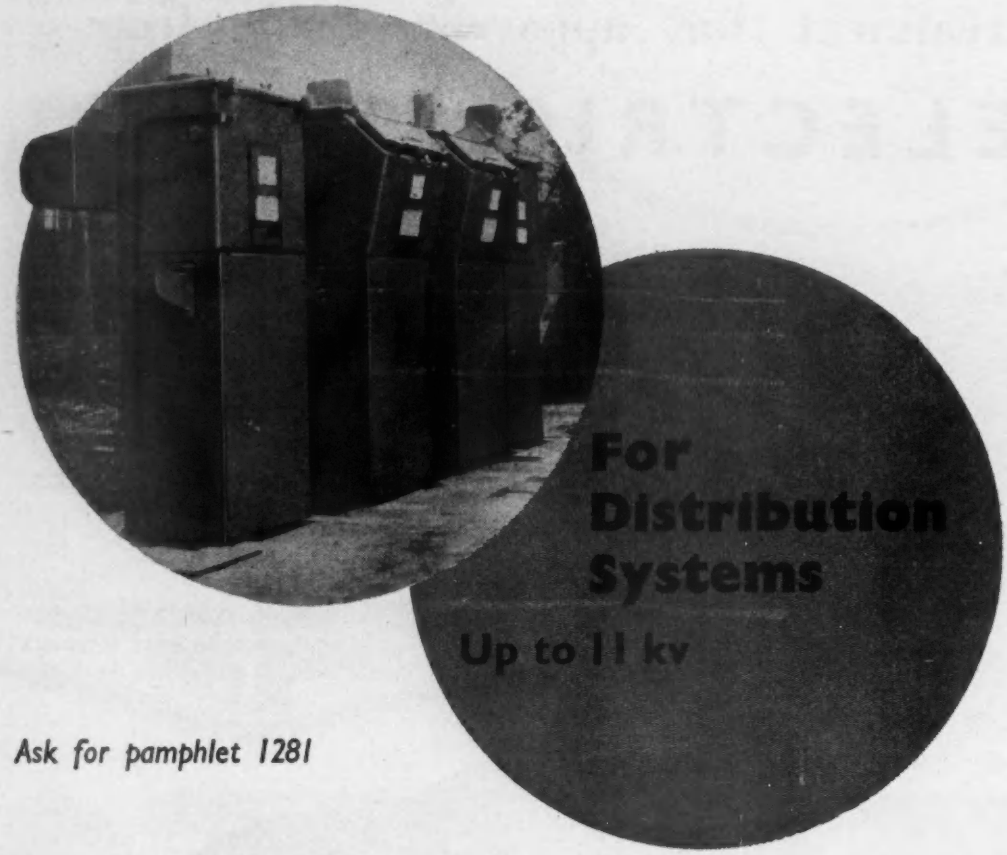

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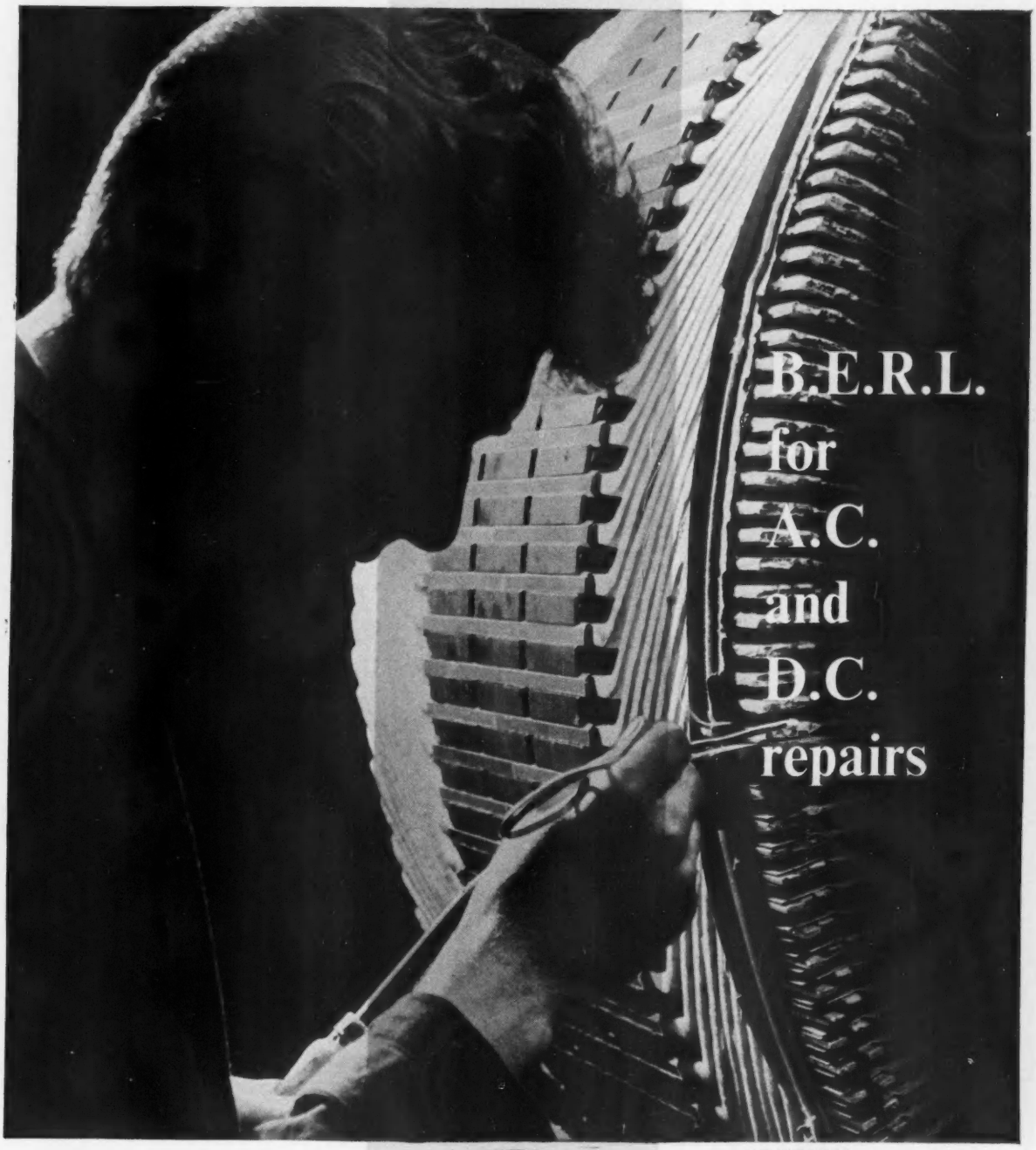

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